15:52:10 OCA PAD AMENDMENT - PROJECT HEADER INFORMATION 10/28/94

Active

Project #: A-60-609 Cost share #: Rev #: 2
Center # : 10/24-6-R7656-0A0 Center shr #: OCA file #:
Work type : RES
Contract#: DE-FG05-92ER75807 Mod #: A002 Document : GRANT
Prime #: Contract entity: GTRC

Subprojects ? : N CFDA: 81.049
Main project #: PE #:

Project unit: NUCL. RES. Unit code: 03.010.466
Project director(s):
KARAM R A NUCL. RES. (404)894-3620

Sponsor/division names: US DEPT OF ENERGY / DOE OAK RIDGE - TN
Sponsor/division codes: 141 / 017

Award period: 920930 to 950929 (performance) 951229 (reports)

Sponsor amount	New this change	Total to date
Contract value	20,370.00	80,370.00
Funded	20,370.00	80,370.00
Cost sharing amount		0.00

Does subcontracting plan apply ?: N

Title: ANNUAL REPORT AND PROPOSAL TO CONTINUE REACTOR SHARING PROGRAM

PROJECT ADMINISTRATION DATA

OCA contact: E. Faith Gleason 894-4820

Sponsor technical contact

DR. LARRY BARKER
(202)596-8947

OFFICE OF UNIVERSITY & SCIENCE PROG.
1000 INDEPENDENCE AVENUE, NW
U.S. DEPARTMENT OF ENERGY
WASHINGTON, D.C. 29585

Sponsor issuing office

MAURICE DAVIS, AD-422
(615)576-7599

SPECIAL ACQUISITIONS BRANCH
PROCUREMENT AND CONTRACTS DIVISION
DOE OAK RIDGE OPERATIONS OFFICE
P.O. BOX 2001
OAK RIDGE, TN 37831-8757

Security class (U,C,S,TS) : U ONR resident rep. is ACO (Y/N): N
Defense priority rating : N/A DOE supplemental sheet
Equipment title vests with: Sponsor GIT X

Administrative comments -
AMENDMENT NO A002 PROVIDES $20,370 FOR FINAL BUDGET PERIOD 9/30/94 THROUGH 9/29/95.

SR562

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

4

NOTICE OF PROJECT CLOSEOUT

Closeout Notice Date 03/27/96

Project No. A-60-609_____ Center No. 10/24-6-R7656-0A0_

Project Director KARAM R A_____ School/Lab NUCL. RES._____

Sponsor US DEPT OF ENERGY/DOE OAK RIDGE - TN_____

Contract/Grant No. DE-FG05-92ER75807_____ Contract Entity GTRC

Prime Contract No. _____

Title ANNUAL REPORT AND PROPOSAL TO CONTINUE REACTOR SHARING PROGRAM_____

Effective Completion Date 950929 (Performance) 951229 (Reports)

Closeout Actions Required:	Y/N	Date Submitted
Final Invoice or Copy of Final Invoice	Y	_____
Final Report of Inventions and/or Subcontracts	Y	_____
Government Property Inventory & Related Certificate	Y	_____
Classified Material Certificate	N	_____
Release and Assignment	N	_____
Other _____	N	_____

Comments_____

_____

Subproject Under Main Project No. _____

Continues Project No. _____

Distribution Required:

Project Director	Y
Administrative Network Representative	Y
GTRI Accounting/Grants and Contracts	Y
Procurement/Supply Services	Y
Research Property Managment	Y
Research Security Services	N
Reports Coordinator (OCA)	Y
GTRC	Y
Project File	Y
Other _____	N
_____	N

NOTE: Final Patent Questionnaire sent to PDPI.

DOE F 1430.22
(04-91)
All other editions
are obsolete
(Replaces DOE F 538)

OMB Control No.
1910–1400
Burden Disclosure
Statement on Back

A-60-609
Del. No 21

U.S. DEPARTMENT OF ENERGY
NOTICE OF ENERGY RD&D PROJECT

1. DOE CONTRACT OR GRANT NUMBER DE-FG05-92ER75807

☐ New contract ☑ Continuation/Revision

2. A. NAME OF PERFORMING ORGANIZATION Georgia Institute of Technology

B. Department or Division NEELY NUCLEAR RESEARCH CENTER

C. Street Address 900 ATLANTIC DR

City ATLANTA State GA Zip 30332-042

D. Type of Performing Organization (circle only one two-letter code)

CU–College, university, or trade school
EG–Electric or gas utility
FF–Federally funded RD&D centers or laboratory operated for agency of US government
IN–Private industry
NP–Foundation or laboratory not operated for profit
ST–Regional, state, or local government facility
TA–Trade or professional organization
US–Federal Agency
XX–Other

3. PRINCIPAL OR SENIOR INVESTIGATOR

A. Last KARAM First RATIB MI A.

B. Phone: Commercial 404-894-3620 FTS 404-853-9325

4. DOE SPONSORING OFFICE OR DIVISION ENERGY RESEARCH

5. TITLE OF PROJECT

REACTOR SHARING

6. DESCRIPTIVE SUMMARY (limit to 200 words)

PROVIDE REACTOR SERVICES TO OTHER UNIVERSITIES TO HELP THEM WITH THEIR RESEARC NEEDS.

---

7. RESPONDENT INFORMATION. List name and address of person filling out this form. Give telephone number and extension where person can be reached. Record the date this form was completed or updated. This information will not be published.

Last KARAM First RATIB MI A.

Address NEELY NUCLEAR RESEARCH CENTER, GEORGIA TECH

City ATLANTA State GA Zip 30332-01

Phone 894-3620 Date 10/2/93

(404)

A-60-609 N/a

Georgia Tech

Office of Grants and Contracts Accounting

Georgia Institute of Technology
190 Bobby Dodd Way
Atlanta, Georgia 30332-0259
USA
404•894•4624; 2629
Fax: 404•894•5519

October 20, 1993

Ms. Melissa Y. Johnson
Special Acquisitions Branch
Procurement and Contract Division
U. S. Department of Energy-Oak Ridge Field Office
P. O. Box 2001
Oak Ridge, TN 37831-8757

REFERENCE: Grant # DE-FG05-92ER75807

Dear Ms. Johnson,

Enclosed is the original plus two (2) copies of the Financial Status Report (SF-269A) for Grant No. DE-FG05-92ER75807 covering the period September 30, 1992 through September 29, 1993.

If you have questions or need additional information, please contact Geraldine Reese or me at (404) 894-2629.

Sincerely,

David V. Welch
Director

DVW/GMR/djt

Enclosures

c: Dr. R. A. Karam, NRC 0425
Ms. Wanda Simon, OCA/CSD 0420
File: A-60-609/R7656-0A0

FINANCIAL STATUS REPORT

(Short Form)

(Follow instructions on the back)

1. Federal Agency and Organizational Element to Which Report is Submitted	2. Federal Grant or Other Identifying Number Assigned By Federal Agency	OMB Approval No.	Page	of
U. S. DEPARTMENT OF ENERGY	DE-FG05-92ER75807	0348-0039	1	1 pages

3. Recipient Organization (Name and complete address, including ZIP code)
GEORGIA TECH RESEARCH CORPORATION
P. O. BOX 100117
ATLANTA, GA 30384

4. Employer Identification Number	5. Recipient Account Number or Identifying Number	6. Final Report	7. Basis
58-0603146	A-60-609/R7656-0A0	☐ Yes ☒ No	☒ Cash ☐ Accrual

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year)	To: (Month, Day, Year)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
September 30, 1992	September 29, 1994	September 30, 1992	September 29, 1993

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	-0-	28,571.55	28,571.55
b. Recipient share of outlays	-0-	-0-	-0-
c. Federal share of outlays	-0-	28,571.55	28,571.55
d. Total unliquidated obligations			-0-
e. Recipient share of unliquidated obligations			-0-
f. Federal share of unliquidated obligations			-0-
g. Total Federal share *(Sum of lines c and f)*			28,571.55
h. Total Federal funds authorized for this funding period			30,000.00
i. Unobligated balance of Federal funds *(Line h minus line g)*			1,428.45

11. Indirect Expense	a. Type of Rate *(Place "X" in appropriate box)* ☒ Provisional ☐ Predetermined ☐ Final ☐ Fixed			
	b. Rate	c. Base	d. Total Amount	e. Federal Share
	SEE BELOW	MTDC	N/A	N/A

12. *Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.*

Questions pertaining to this report should be directed to: Geraldine Reese (404) 894-2629

GEORGIA TECH'S FISCAL YEAR ENDS JUNE 30

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
David V. Welch, Director, Grants and Contracts Accounting	(404) 894-2629
Signature of Authorized Certifying Official	**Date Report Submitted**
	October 20, 1993

NSN 7540-01-218-4387 269-201 Standard Form 269A (REV 4-88) Prescribed by OMB Circulars A-102 and A-110

	Direct Costs	Indirect Costs
FY93 @ 44.9%	28,501.00	-0-
FY94 @ 37.0%	70.55	-0-

A-60-609
N14

Georgia Tech

Office of Grants and Contracts Accounting

Georgia Institute of Technology
190 Bobby Dodd Way
Atlanta, Georgia 30332-0259
USA
404•894•4624; 2629
Fax: 404•894•5519

November 15, 1994

Mr. Maurice Davis
Special Acquisitions Branch
Procurement and Contract Division
U. S. Department of Energy-Oak Ridge Field Office
P. O. Box 2001
Oak Ridge, TN 37831-8757

REFERENCE: Grant # DE-FG05-92ER75807

N 17

Dear Mr. Davis,

Enclosed is the original plus two (2) copies of the Financial Status Report (SF-269A) for Grant No. DE-FG05-92ER75807 covering the period September 30, 1993 through September 29, 1994.

If you have questions or need additional information, please contact Geraldine Reese or me at (404) 894-2629.

Sincerely,

David V. Welch
Director

DVW/GMR/djt

Enclosures

c: Dr. R. A. Karam, NRC 0425
Ms. Wanda Simon, OCA/CSD 0420
File: A-60-609/R7656-0A0

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U. S. DEPARTMENT OF ENERGY	DE-FG05-92ER75807	0348-0039	1	1 pages

3. Recipient Organization (Name and complete address, including ZIP code)

GEORGIA TECH RESEARCH CORPORATION
400 10TH STREET, N.W. - RM 270
ATLANTA, GA 30332-0415

4. Employer Identification Number	5. Recipient Account Number or Identifying Number	6. Final Report	7. Basis
58-0603146	A-60-609/R7656-0A0	☐ Yes ☒ No	☒ Cash ☐ Accrual

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year)	To: (Month, Day, Year)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
September 30, 1992	September 29, 1995	September 30, 1993	September 29, 1994

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	28,571.55	-0-	28,571.55
b. Recipient share of outlays	-0-	-0-	-0-
c. Federal share of outlays	28,571.55	-0-	28,571.55
d. Total unliquidated obligations			-0-
e. Recipient share of unliquidated obligations			-0-
f. Federal share of unliquidated obligations			-0-
g. Total Federal share (Sum of lines c and f)			28,571.55
h. Total Federal funds authorized for this funding period			60,000.00
i. Unobligated balance of Federal funds (Line h minus line g)			31,428.45

11. Indirect Expense	a. Type of Rate (Place "X" in appropriate box) ☒ Provisional ☐ Predetermined ☐ Final ☐ Fixed			
	b. Rate	c. Base	d. Total Amount	e. Federal Share
	SEE BELOW	MTDC	N/A	N/A

12. *Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.*

Questions concerning this report should be directed to:
Geraldine Reese (404) 894-2629

GEORGIA TECH'S FISCAL YEAR ENDS JUNE 30

13. Certification: **I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.**

Typed or Printed Name and Title	Telephone (Area code, number and extension)
David V. Welch, Director, Grants and Contracts Accounting	(404) 894-2629
Signature of Authorized Certifying Official	**Date Report Submitted**
	November 15, 1994

NSN 7540-01-218-4387

269-201

Standard Form 269A (REV 4-88)
Prescribed by OMB Circulars A-102 and A-110

	Direct Costs	Indirect Costs
FY93 @ 44.9%	$28,501.00	-0-
FY94 @ 37.0%	70.55	-0-
FY95 @ 40.0%	-0-	-0-

A-60-609
n/a

Georgia Tech

Office of Grants and Contracts Accounting

Georgia Institute of Technology
190 Bobby Dodd Way
Atlanta, Georgia 30332-0259
USA
404•894•4624; 2629
Fax: 404•894•5519

November 20, 1995

Mr. Maurice Davis
Special Acquisitions Branch
Procurement and Contract Division
U. S. Department of Energy-Oak Ridge Field Office
P. O. Box 2001
Oak Ridge, TN 37831-8757

REFERENCE: Grant # DE-FG05-92ER75807

Dear Mr. Davis,

Enclosed is the original plus two (2) copies of the Financial Status Report (SF-269A) for Grant No. DE-FG05-92ER75807 covering the period September 30, 1994 through September 29, 1995.

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Sincerely,

David V. Welch
Director

DVW/GMR/djt

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Ms. Wanda Simon, OCA/CSD 0420
File: A-60-609/R7656-0A0

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GEORGIA TECH RESEARCH CORPORATION
400 10TH Street, N.W. - RM 270
Atlanta, GA 30332-0415

4. Employer Identification Number	5. Recipient Account Number or Identifying Number	6. Final Report	7. Basis
58-0603146	A-60-609/R7656-0A0	☐ Yes ☒ No	☒ Cash ☐ Accrual

8. Funding/Grant Period (See Instructions) From: (Month, Day, Year)	To: (Month, Day, Year)	9. Period Covered by this Report From: (Month, Day, Year)	To: (Month, Day, Year)
September 30, 1992	September 29, 1995	September 30, 1994	September 29, 1995

10. Transactions:	I Previously Reported	II This Period	III Cumulative
a. Total outlays	28,571.55	13,077.75	41,649.30
b. Recipient share of outlays	-0-	-0-	-0-
c. Federal share of outlays	28,571.55	13,077.75	41,649.30
d. Total unliquidated obligations			-0-
e. Recipient share of unliquidated obligations			-0-
f. Federal share of unliquidated obligations			-0-
g. Total Federal share (Sum of lines c and f)			41,649.30
h. Total Federal funds authorized for this funding period			80,370.00
i. Unobligated balance of Federal funds (Line h minus line g)			38,720.70

11. Indirect Expense

a. Type of Rate (Place "X" in appropriate box) ☒ Provisional ☐ Predetermined ☐ Final ☐ Fixed

b. Rate	c. Base	d. Total Amount	e. Federal Share
See below	MTDC	N/A	N/A

12. Remarks: Attach any explanations deemed necessary or information required by Federal sponsoring agency in compliance with governing legislation.
Questions concerning this report should be directed to:
Geraldine Reese (404) 894-2629

GEORGIA TECH'S FISCAL YEAR ENDS JUNE 30

13. Certification: I certify to the best of my knowledge and belief that this report is correct and complete and that all outlays and unliquidated obligations are for the purposes set forth in the award documents.

Typed or Printed Name and Title	Telephone (Area code, number and extension)
David V. Welch, Director, Grants and Contracts Accounting	(404) 894-2629
Signature of Authorized Certifying Official	**Date Report Submitted**
	November 20, 1995

	DIRECT COSTS	INDIRECT COSTS
FY93@ 44.9%	28,501.00	-0-
FY94@ 37.0%	70.55	-0-
FY95@ 40.0%	13,077.75	-0-
FY96@ 43.0%	-0-	-0-

ANNUAL REPORT AND PROPOSAL TO CONTINUE REACTOR SHARING PROGRAM

For the Period
September 1, 1991 - August 31, 1992

BY

R. A. KARAM

and

The Staff of the Neely Nuclear Research Center

Neely Nuclear Research Center
Georgia Tech Research Reactor

PREPARED FOR

U.S. Department of Energy
Under Contract No. DE-FG07-80ER10771

TABLE OF CONTENTS

PREFACE

Administrative responsibility for the Neely Nuclear Research Center (NNRC) resides in the Office of the Vice President for Interdisciplinary Programs of the Georgia Institute of Technology. The NNRC houses two major facilities: the Georgia Tech Research Reactor (GTRR) and the Hot Cell Laboratory. The NNRC is a facility of the University System of the State of Georgia and is available to all universities.

This annual progress report of the operation of the GTRR and NNRC is submitted to DOE in accordance with the requirement of Contract No. DE-FG05-80ER10771.

HIGHLIGHTS

The following universities (other than Georgia Tech) have used the facilities at the Neely Nuclear Research Center:

1.	Arizona State University	Arizona
2.	Medical College of Georgia	Georgia
3.	Mississippi State	Mississippi
4.	University of Georgia	Georgia
5.	University of Oklahoma	Oklahoma
6.	Oklahoma State University	Oklahoma
7.	University of Miami	Florida
8.	Tuskegee Institute	Alabama

The inventory of Co-60 sources at the Hot Cell Laboratory is 400,000 Ci. Dose rates of up to 1.0 E7 rads per hour are possible.

Nineteen commercial companies have used the facilities at NNRC.

The sum of $501,578 in sponsored research and services was obtained during the year to support the Center's activities.

Seven graduate students were financially supported by the Center last year.

Twenty four undergraduate and six graduate students have used the NNRC facilities in laboratory courses.

Over one thousand two hundred visitors from high schools, educational institutions, industry and foreign countries have had conducted tours at the Center.

Over 120 students from Georgia Tech were trained in radiological safety.

Twenty-seven new or revised procedures were written, approved, and instituted at the Neely Nuclear Research Center to bring the use of radioactive substance on the campus under better national safety standards.

There were no violations cited by inspectors from the Nuclear Regulatory Commission or the State of Georgia.

There were four radioactive waste shipments to Barnwell, S.C. from the Georgia Tech campus.

Efforts are continuing with EG&G Idaho to use the GTRR for Boron Neutron Capture Therapy.

I. INTRODUCTION

The Neely Nuclear Research Center, Georgia Institute of Technology, has been a participant in the University Reactor Sharing Program since 1970. During this period, NNRC has made available its 5 MW research reactor, its Co-60 irradiation facility, and its activation analysis laboratory to large numbers of students and faculty from many universities and colleges.

This report of NNRC utilization is prepared in compliance with the requirement of Contract No. DE-FG05-80ER10771 between the U.S. Department of Energy and the Georgia Institute of Technology. The report contains information with regard to facilities descriptions (brief), personnel, organization, and programs.

The Neely Nuclear Research Center of the Georgia Institute of Technology houses two major facilities: the Georgia Tech Research Reactor and the Hot Cell Laboratory.

The GTRR is a heterogeneous, heavy-water moderated and cooled reactor, fueled with plates of aluminum-uranium alloy. It is designed to produce a thermal flux of more than 1.0 E14 $n/cm^2/sec$ at a power of 5 MW and an exit moderator temperature of 139°F.

The reactor core is approximately two feet in diameter, two feet high and, when fully loaded, contains provisions for up to nineteen fuel assemblies spaced six inches apart in a triangular array. Each assembly contains sixteen fuel plates. The total uranium-235 content of a full loading is 3.6 kg. The fuel is centrally located in a six foot diameter aluminum reactor vessel which provides a two foot thick D_2O reflector completely surrounding the core.

II. NNRC Activities

II.1 Reactor Location and Other Specifics

II.1.1 University: Georgia Institute of Technology
Atlanta, GA 30332-0425

II.1.2 Program Director: R.A. Karam (404-894-3620)

II.1.3 Grant #: DE-FG07-80ER10771

II.1.4 Reactor Type/Power Level: Tank Type/5 MW Heavy Water

II.2 Staff and Administration

II.2.1. The following personnel were employed at NNRC full time for the entire reporting period:

1. R.A. Karam, Director
2. Rodney D. Ice, Manager, Office of Radiation Safety
3. Billy Statham, Reactor Supervisor and Electronic Engineer
4. Clara Galleshaw, Administrative Assistant
5. Jerry Taylor, Senior Engineering Safety Assistant
6. Edgar Jawdeh, Health Physicist
7. Bill Downs, Senior Reactor Operator
8. Dixon Parker, Reactor Operator
9. Arlene Smith, Administrative Secretary.

II.2.2. The following personnel were employed part time:

1. Betty Revsin
2. James O'Hara
3. David Cox
4. Nazih Chbeir

II.2.3. The following Graduate Students were given GRA's during the reporting period:

1. Thomas Evans
2. Nazih Chbeir
3. Kate Klee
4. Hannah Mitchell
5. John Hawkinson
6. Fred Kelly
7. Hong Ning

II.3 **Educational Output**

II.3.1 The following courses were taught using the GTRR:

N.E. 4205 Nuclear Reactor Laboratory - Fall 1990
N.E. 4260 Radiation Transport and Shielding -Winter 1992
N.E. 8503 Special Problems (Nazih Chbeir and Edgar Jawdeh) - Spring 1992

II.3.2 **Degrees**

Edgar Jawdeh - MS Health Physics
Nazih Chbeir - MS Health Physics
Fred Kelly - MS Nuclear Engineering
John Hawkinson - MS Nuclear Engineering

II.3.3 **Short courses taught**

Radiation protection short course given every quarter and attended by more than 30 students each quarter.

II.3.4 **Other Courses which used NNRC facilities**

N.E. 6110 Radiation Detection - Fall 1991
N.E. 6110 Radiation Detection - Winter 1992
N.E. 3110 Radiation Detection - Spring 1992

II.3.5 **High School student tours**

NNRC conducted tours to high school students interested in nuclear science. More than 1200 students have toured the NNRC facilities.

II.3.6 **Use of NNRC facilities by other universities**

The following table shows how principal investigators from various universities, used NNRC facilities, primarily the GTRR, through the Reactor Sharing Program funded by DOE.

TABLE I
Reactor Sharing Services
Sept. 1, 1991 - August 31, 1992

Institution	P.I.	# Students Involved	Program	Reactor Sharing Support
Arizona State	(1) Dr. Paul Fitzgerald (2) E. Stump	6	Fission Track Dating, Uplift and formation of mountain chains	22,410.00
Tuskegee Inst.	Dr. P. Loretan	8	Bone Marrow Transplant in Mice	250.00
Medical College of Georgia	Dr. R. Whitney	3	Bone Marrow Transplant in Mice	1,050.00
University of Miami	Dr. P. Swartz	12	Activation of Carbonate Rocks for determination of CO_2 variation in atmosphere	1,240.00
Mississippi State	Dr. Charles Sparrow	7	Reactor Laboratory of Mississippi State students	350.00
University of Oklahoma	Dr. Barry Weaver	8	Rare Earth Elements determinations as a tool for rock origin verification;	2,900.00
University of Georgia	Dr. Robert Wilkinson	9	Activation analysis of plant roots to determine scandium and Other Trace Elements	1,050.00
High School Tours		1200		5,000.00
TOTAL				35,250.00

II.4. **NNRC's staff efforts under U.S. NRC's License No. R-97 and under the State of Georgia License No. 147-1 and License No. 21-2.**

II.4.1. **Procedure writing and Revision**

Significant effort was made to upgrade and write new procedures to bring the use of radioactive substances on the campus of Georgia Tech under national safety standards. A list of these procedures follows.

Proc. #	Title
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
2006	Reactor Shutdown Checklist
9150	Operation and Calibration of Area Radiation Monitors
9312	Sealed Sources Leak Test
9041	Storage Pool Water Sampling and Analysis
9304	Routine Facility Radiation Surveys
9018	Charcoal Cartridge Analysis
9400	Environmental Monitoring
7204	Floor Fuel Storage Water
9250	Facilities Contamination Surveys
9300	Respiratory Protection
6080	Accidental Release of High Levels of Gaseous Activity to the Atmosphere
6090	Personnel Monitoring After Building Evacuation Emergency Situations
9250	Facilities contamination Surveys
9057	Calibration Procedure for Eberline Model E-120 GM Survey Meter

Proc. #	Title
9058	Calibration Procedure for Eberline Model RM-14 Rate Meter
9060	Calibration Procedure for Bicron Model RSO-5 Survey Meter
9063	Calibration Procedure for Ludlum Model 2 GM Survey Meter
9065	Calibration Procedure for Bicron Model RSO-500 Survey Meter
9072	Calibration Procedure for Eberline Model RO-2 Survey Meter
7285	Calibration of Reactor Coolant Temperature Measuring System
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
7202	Control Rod Drop-Time
7226	Scram Insertion Delay Time Measurement
9501	Control & Accountability of Radioactive Sources
7241	Reactor Tank Level Transmitter Maintenance and Calibration Check
4950	Tagging Equipment Out of Service

II.4.2 **Procedure Deletion**

The following procedures were deleted by the Nuclear Safeguards Committee:

Proc. #	Title
3301	Sampling Log-D20
3302	Sampling Log H20
3303	Sampling Log Blanket Gas
4060	Top Reflector Dump Time Measurement

II.4.3 **U.S. NRC and State Inspections**

During the reporting period there were four U.S. NRC inspections and one State of Georgia inspection which involved four inspectors. In all of these inspections, there were no violations or deviations.

II.4.4 **Requalifications Program for Reactor Operators**

The U.S. NRC requested that NNRC develop a formal requalification program for reactor operators. Such a program was written and submitted to NRC January 2, 1991. It was approved September, 1991.

II.5 **Research Output**

II.5.1 **MS Granted**

Four MS degrees in Health Physics were granted: Edgar Jawdeh, Nazih Chbeir, John Hawkinson and Fred Kelly.

II.5.2 **Publication**

II.5.2.1 **Published**

"Status Report of the Conversion of the GTRR to Low Enrichment Fuel", R. A. Karam, J. E. Matos, S. T. Mo, and W. L. Woodruff, International Meeting on Reduced Enrichment for Research and Test Reactors, Jakarta, Indonesia, Nov. 3-7, 1991.

II.5.2 **Progress Reports**

Four progress reports were written to DOE on the Conversion of the GTRR fuel from high to low enrichment. These reports are generated under DOE contract A-60-617.

II.6 **Budget Information**

II.6.1 **Institutional Funds**

II.6.1.1. Regular institutional allocations to NNRC during reporting period were $380,372. This money was spent to partially cover personnel services.

II.6.1.2 Special allocations for radioactive waste disposal were $17,316.54.

II.6.2 **External Funds ($501,578.00)**

II.6.2.1 **DOE Funds**

The following funds were obtained from DOE:

1.	Low Enrichment Study	$51,502
2.	Reactor Sharing	30,000
3.	Upgrading GTRR	24,106
	Total	$105,608

II.6.2.2 **ERDA Funding**

The funding for ERDA Administration was $94,000.00.

II.6.2.3 **EG&G Funds**

Funding from EG&G totaled $23,925.00.

II.6.2.4 **Various Companies**

Nineteen companies from the metropolitan area of Atlanta and the rest of the U.S. used the NNRC facilities. Revenues from these companies totaled $278,045.00.

III. **Problems/Areas of Need/Priorities**

III.1. **Instrument**

Instruments upgrade are needed in few areas. For the reactor the following are needed:

(1) Primary and secondary coolant flow instruments;
(2) Startup channel fission chamber;
(3) Auto controller;
(4) Intercom system.

In the radiation protection area, a low background β/γ automatic counter was purchased and installed.

Other needed improvements include a new filter for BNCT applications.

III.2 **Personnel**

A minimum of two additional reactor operators are needed to give us adequate depth to cover anticipated increase in reactor activities and/or possible decrease due to attrition.

IV. **Plans for FY94**

IV.1 Boron Neutron Capture Therapy

There is a general need in the U.S. for a quality beam of neutrons for BNCT experimentation. The Georgia Tech Research Reactor (GTRR) is perceived by numerous groups in BNCT research as the best facility for BNCt applications. The GTRR needs a filter installed in the biomedical facility to produce an optimized epi-thermal neutron beam. There are two different designs for this filter: one design produced by Dr. David Nigg of EG&G at INEL and another design produced by R. A. Karam and Kate Klee of the Georgia Institute of Technology. The estimated cost of installing the Karam/Klee filter is $2000,000. The estimate of installing the Nigg filter is $500,000-1,000,000. It is essential that one filter is installed in 1994 so that the technology for BNCT application is developed on a timely basis.

IV.2. Other Uses

The NNRC facilities will continue to be used for research, for service to industry, and for education.

BUDGET REQUEST FOR FY 94

Table II

BUDGET REQUEST

For the 1993-1994 University Reactor Sharing Program, Georgia Tech is requesting funding in the amount of $40,000.

We believe that irradiation services at published rates including the use of the reactor and related facilities and any necessary technical assistance by the user institution requires $40,000.00.

V. Partial Publications Generated through the use of the Georgia Tech Research Reactor

1. Graham, Waverly (1966), "The Determination of Effective Delayed Neutron and Photoneutron Kinetics Parameters in as Highly Enriched Heavy-Water Reactor," School of Nuclear Engineering, Georgia Tech.

2. Macdonald, Robert (1966), "A Method for the Analysis of Modulated Neutron Experiments," School of Nuclear engineering, Georgia Tech.

3. Johnson, Robert (1967), "Investigation of the Space-Dependent Zero-Power Reactor Source Transfer Function," School of Nuclear Engineering, Georgia Tech.

4. McGhee, (1969), "Measurement of Neutron Diffusion Parameters of Heavy Water and Spheres by the Pulsed Neutron Source Method," School of Nuclear Engineering, Georgia Tech.

5. Champlin, Jerry B. (1970), "The Transport of Radioisotopes by Fine particulate Matter in Aquifers," School of Nuclear Engineering, Georgia Tech.

6. Walker, David, M. (1970), "An Investigation of Multiple Gamma Scattering in Germanium as Applied to GE(LI) Gamma Spectrometers," School of Nuclear Engineering, Georgia Tech.

7. Wilkie, William H. (1970), "Theoretical Image-Forming Quality of Fast-Neutron Radiography," School of Nuclear Engineering, Georgia Tech.

8. Bridges, Donald N. (1971), "An Investigation of the Spatially-Dependent Reactor Source Transfer Function with Temperature Feedback," School of Nuclear Engineering, Georgia Tech.

9. Ebert, David (1972), "Space and Energy-Dependent Noise Analysis Using Modal Expansions," School of Nuclear Engineering, Georgia Tech.

10. Lord, Robert J. (1972), "Simulated Boiling Effects in a Subcritical Assembly," School of Nuclear Engineering, Georgia Tech.

11. Lake, James (1973), "Measurement of Steady-State Space-Dependent Thermal Neutron Spectra in Beryllium," School of Nuclear Engineering, Georgia Tech.

12. Shamasundar, B.I. (1973), "Investigation of Neutron Thermalization in Polycrystalline Moderators," School of Nuclear Engineering, Georgia Tech.

13. Sohrabi, M. (1975), "Electrochemical Etching Amplification of Low-Lit Recoil Particle Tracks in Polymers for Fast Neutron Dosimetry," School of Nuclear Engineering, Georgia Tech.

14. Jameson, (1976), "Analysis of Fissionable Material by Delayed Emissions," School of Nuclear Engineering, Georgia Tech.

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16. Alzaidi, Samir (1977), "New Neutron Detector Using Magnetically Focused Electrons for Fast Reactor Neutron Flux Measurements," School of Nuclear Engineering, Georgia Tech.

17. Reed, Rodican P. (1977), "Neutron Activation analysis of Cataractous Lenses of Mice and Mongolian Gerbils Exposed to Acute Doses of X-rays, Thermal and Fast Neutrons," School of Nuclear Engineering, Georgia Tech.

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19. Wahlig, Barry G. (1981), "Transport of Suspended Matter Through Rock formations," School of Nuclear Engineering, Georgia Tech.

20. Sanders, Michael E. (1983), Design and Application of a Damage-Trac-K Neutron Dosimeter Useable in the 1 EV to 17 MEV Neutron Energy Region," School of Nuclear Engineering, Georgia Tech.

21. Noonan, Denise J. (1984), "An Epithermal Neutron Beam Approach to Boron Neutron Capture Therapy," School of Nuclear Engineering, Georgia Tech.

22. Dawes, M.A., R.S. Saini, M.a. Mullen, J.H. Brower, and P.A. Loretan (1986), "Sensitivity of Sweet Potato Weevil (Coleoptera: Curculionidae) to Gamma Radiation." Accepted for publication in Journal to Economic Entomology.

23. Lu, J.Y., C. Stevens and P.A. Loretan (1986), "The Effect of Gamma, Electron Beam and Ultraviolet Radiation on the Control of Storage rot and the Quality of Walla Walla Onions." Submitted to the Journal of Food Science for Publication.

24. Lu, J.Y., S. White, P. Yakubu and P.A. Loretan (1986), "Effects of Gamma Radiation on Nutritive and Sensory Qualities of Sweet Potato Storage Roots." Submitted to Journal of Food Quality for publication.

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28. "Reaction of Benzenediazonium-2-carboxylate with Reactor-Produced No-Carrier-Added ^{18}F-Fluoride: A Novel Synthesis of 2-[^{18}F]-Fluorobenzoic Acid." A.D. Strouphauer, C.L. Liotta, and R.W. Fink, Int. J. Appl. Radiat. and Isotopes (accepted and in press for early 1984); accepted for presentation at the Symposium on Chemical Considerations in the Labeling of Radiopharmaceuticals with Short-Lived Radionuclides at the American Chemical Society meeting, April, 1984, St. Louis, Missouri.

29. "Preparation of $H^{18}F$,$K^{18}F$,$K^{18}FF_3$ from Reactor-Produced ^{18}F-Fluoride for the Sunthesis of Radioactive ^{18}F-Labeled Aromatic Compounds," A.D. Strouphauer, M.S. thesis, School of Chemistry, Georgia Tech (June, 1983).

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31. "The Preparation of Reactor-Produced, Carrier-Free ^{18}F-Fluoride for the Synthesis of Labeled Organic Compounds," Part II, Bruce Edward Gnade, Ph.D. thesis, School of Chemistry, Georgia Tech (September, 1982).

32. "Preparation of Reactor-Produced No-Carrier Added ^{18}F-Fluoride and Its Use in the Sunthesis of Labeled Organic Compounds of Interest in Radiopharmaceuticals (tentative title), R.W. Fink, to be presented as a review paper at the Int. Conf. on Nuclear and Radiochemistry, Lindau, West Germany, October, 1984 (tentative, pending travel grant from Georgia Tech Foundation.

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36. "The K-Shell Conversion Coefficient of the 135.5 keV M4 Transition in ^{193m}Pt decay," A.I. Saleh, R.A. Braga, and R.W. Fink, Z. Physik A279, 27 (1976).

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38. "Trace Elements in Normal and Malignant Human Breast Tissue," A.E. Schwartz, G.W. Leddicotte, R.W. Fink, and E.W. Friedman, Surgery 76, 325 (1974).

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A-60-609
n/a

ANNUAL REPORT AND PROPOSAL TO CONTINUE REACTOR SHARING PROGRAM

For the Period
September 1, 1993 - August 31, 1994

BY

R. A. KARAM

Neely Nuclear Research Center
Georgia Tech Research Reactor

PREPARED FOR

U.S. Department of Energy
Under Contract No. DE-FG07-80ER10771

TABLE OF CONTENTS

PREFACE

Administrative responsibility for the Neely Nuclear Research Center (NNRC) resides in the Office of the Vice President for Interdisciplinary Programs of the Georgia Institute of Technology. The NNRC houses two major facilities: the Georgia Tech Research Reactor (GTRR) and the Hot Cell Laboratory. The NNRC is a facility of the University System of the State of Georgia and is available to all universities.

This annual progress report of the operation of the GTRR and NNRC is submitted to DOE in accordance with the requirement of Contract No. DE-FG05-80ER10771.

HIGHLIGHTS

The following universities (other than Georgia Tech) have used the facilities at the Neely Nuclear Research Center:

1.	Arizona State University	Arizona
2.	Medical College of Georgia	Georgia
3.	Mississippi State	Mississippi
4.	University of Oklahoma	Oklahoma
5.	Oklahoma State University	Oklahoma
6.	Lehigh University	Pennsylvania
7.	Emory University	Georgia
8.	University of Pennsylvania	Pennsylvania

The inventory of Co-60 sources at the Hot Cell Laboratory is 250,000 Ci. Dose rates of up to 1.0 E7 rads per hour are possible.

Fifteen commercial companies have used the facilities at NNRC.

The sum of $359,696 in sponsored research and services was obtained during the year to support the Center's activities.

Nine graduate students were financially supported by the Center last year.

Thirty seven undergraduate and five graduate students have used the NNRC facilities in laboratory courses.

Over one thousand one hundred visitors from high schools, educational institutions, industry and foreign countries have had conducted tours at the Center.

Over 120 students from Georgia Tech were trained in radiological safety.

Twenty-eight new or revised procedures were written, approved, and instituted at the Neely Nuclear Research Center to bring the use of radioactive substance on the campus under better national safety standards.

Collaboration on Boron Neutron Capture Therapy (BNCT) with Emory University continues. A new Georgia Tech-Emory Center for cancer research has been formed. The main thrust of this center is BNCT research.

I. INTRODUCTION

The Neely Nuclear Research Center, Georgia Institute of Technology, has been a participant in the University Reactor Sharing Program since 1970. During this period, NNRC has made available its 5 MW research reactor, its Co-60 irradiation facility, and its activation analysis laboratory to large numbers of students and faculty from many universities and colleges.

This report of NNRC utilization is prepared in compliance with the requirement of Contract No. DE-FG05-80ER10771 between the U.S. Department of Energy and the Georgia Institute of Technology. The report contains information with regard to facilities descriptions (brief), personnel, organization, and programs.

The Neely Nuclear Research Center of the Georgia Institute of Technology houses two major facilities: the Georgia Tech Research Reactor and the Hot Cell Laboratory.

The GTRR is a heterogeneous, heavy-water moderated and cooled reactor, fueled with plates of aluminum-uranium alloy. It is designed to produce a thermal flux of more than 1.0 E14 $n/cm^2/sec$ at a power of 5 MW and an exit moderator temperature of 139°F.

The reactor core is approximately two feet in diameter, two feet high and, when fully loaded, contains provisions for up to nineteen fuel assemblies spaced six inches apart in a triangular array. Each assembly contains sixteen fuel plates. The total uranium-235 content of a full loading is 3.6 kg. The fuel is centrally located in a six foot diameter aluminum reactor vessel which provides a two foot thick D_2O reflector completely surrounding the core.

II. NNRC Activities

II.1 Reactor Location and Other Specifics

II.1.1 University: Georgia Institute of Technology
Atlanta, GA 30332-0425

II.1.2 Program Director: R.A. Karam (404-894-3620)

II.1.3 Grant #: DE-FG07-80ER10771

II.1.4 Reactor Type/Power Level: Tank Type/5 MW Heavy Water

II.2 Staff and Administration

II.2.1. The following personnel were employed at NNRC full time for the entire reporting period:

1. R.A. Karam, Director
2. Rodney D. Ice, Manager, Office of Radiation Safety
3. Billy Statham, Electronic Engineer
4. Dixon Parker, Reactor Supervisor
5. Clara Galleshaw, Administrative Coordinator
6. Jerry Taylor, Senior Engineering Safety Assistant
7. Edgar Jawdeh, Health Physicist
8. Neil Copeland, Senior Reactor Operator
9. Arlene Smith, Administrative Secretary.

II.2.2. The following personnel were employed part time:

Jeremy Sweezy, SRO; Dwayne Blaylock, RO; Peter Newby, RO; Ralph Demeglio, RO

II.2.3. The following Graduate Students were given GRA's during the reporting period:

1. Thomas Evans
2. Jeremy Sweezy
3. Kate Klee
4. Hannah Mitchell
5. Peter Newby
6. Dwayne Blaylock
7. Jerry Ellsworth
8. Joe Martin
9. John Brunson

II.3 Educational Output

II.3.1 The following courses were taught using the GTRR:

N.E. 4205 Nuclear Reactor Laboratory - Fall 1990
N.E. 4260 Radiation Transport and Shielding -Winter 1992
N.E. 4210 Reactor Operation

II.3.2 Degrees

Kate Klee - PhD Health Physics

II.3.3 Short courses taught

Radiation protection short course given every quarter and attended by more than 30 students each quarter.

II.3.4 Other Courses which used NNRC facilities

N.E. 6110 Radiation Detection - Fall 1993
N.E. 6110 Radiation Detection - Winter 1994
N.E. 3110 Radiation Detection - Spring 1994

II.3.5 High School student tours

NNRC conducted tours to high school students interested in nuclear science. More than 1100 students have toured the NNRC facilities.

II.3.6 Use of NNRC facilities by other universities

The following table shows how principal investigators from various universities, used NNRC facilities, primarily the GTRR, through the Reactor Sharing Program funded by DOE.

TABLE I
Reactor Sharing Services
Sept. 1, 1993 - August 31, 1994

Institution	P.I.	# Students Involved	Program	Reactor Sharing Support
Arizona State	(1) Dr. Paul Fitzgerald (2) E. Stump	6	Fission Track Dating, Uplift and formation of mountain chains	22,555.25
Emory Univ.	Dr. Raymond Schinazy	5	BNCT	1,500.00
Medical College of Georgia	Dr. R. Whitney	3	Bone Marrow Transplant in Mice	807.75
Mississippi State	Dr. Charles Sparrow	7	Reactor Laboratory of Mississippi State students	3,000.00
University of Oklahoma	Dr. Barry Weaver	8	Rare Earth Elements determinations as a tool for rock origin verification;	637.00
Oklahoma State Univ.	Dr. Brian Carter		Fission Track Dating	1,500.00
University of IL			Irradiation Services	550.00
University of PA			Irradiation Services	600.00
High School Tours		1200		5,000.00
TOTAL				36,150.00

II.4. NNRC's staff efforts under U.S. NRC's License No. R-97 and under the State of Georgia License No. 147-1 and License No. 21-2.

II.4.1. Procedure writing and Revision

Significant effort was made to upgrade and write new procedures to bring the use of radioactive substances on the campus of Georgia Tech under national safety standards. A list of these procedures follows.

Proc. #	Title
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
6080	Accidental Release of High Levels of Gaseous Activity to the Atmosphere
6100	Emergency Notification
9250	Facilities Contamination Surveys
9013	Calibration and Testing of Moving Air Particulate Monitor
9037	Tritium Determination in Urine
9038	Bioassay Program
9300	Respiratory Protection
7241	Reactor Tank Level Transmitter Maintenance and Calibration Check
9304	Routine Facility Radiation Surveys
9308	Airborne Radioactivity Surveys
9310	Posting of Radiological Control Areas and Materials
9040	Liquid Waste Tank Analysis
9010	Kanne Chamber Calibration
9501	Control & Accountability of Radioactive Sources

Proc. #	Title
9510	Radioactive Material Shipment
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
9074	Calibration Procedure for Eberline Model PIC-6A Survey Meter
9015	Cooling Water Gamma Monitor
3800	Liquid Waste Disposal
3802	Liquid Waste System-Valve Lineup
7280	MAP-1 Recorder Calibration
0001	Access Control and Accountability of Keys and Access Cards
3500	Moderator Inventory
4501	Fuel Element Self Protection Measurement
7246	Control Element Reactivity Worth Measurement

There were three procedures cancelled:

2500	Containment Building Health Physics Procedures
7276	Temperature Recorder Calibration RTD Input
9054	Calibration of the Low Beta II Alpha/Beta Counting System

II.4.2 U.S. NRC and State Inspections

During the reporting period there were four U.S. NRC inspections and one State of Georgia inspection which involved four inspectors.

II.4.3 Requalifications Program for Reactor Operators

The U.S. NRC examined three canditates for RO licenses, and two for SRO licenses. All candidates passed.

II.5 Research Output

II.5.1 MS Granted

None

II.5.2 Publication

II.5.2.1 Published

"Conceptual Design for an Advanced Epithermal Neutron Beam for BNCT at the GTRR", Sixth International Conference on BNCT, Kobe, Japan, Nov. 1-4, 1994.

II.6 Budget Information

II.6.1 Institutional Funds

II.6.1.1. Regular institutional allocations to NNRC during reporting period were $406,957. This money was spent to partially cover personnel services.

II.6.2 External Funds ($359,696.00)

II.6.2.1 DOE Funds

The following funds were obtained from DOE:

1. Reactor Sharing 30,000

II.6.2.2 ERDA Funding

The funding for ERDA Administration was $192,172.00.

II.6.2.4 Various Companies

Fifteen companies from the metropolitan area of Atlanta and the rest of the U.S. used the NNRC facilities. Revenues from these companies totaled $137,524.00.

III. Problems/Areas of Need/Priorities

III.1. Instrument

Instruments upgrade are needed in few areas. For the reactor the following are needed:

(1) Auto controller;
(2) Intercom system.

Other needed improvements include a new filter for BNCT applications.

III.2 Personnel

Three additional reactor operators were added to the operating staff.

IV. Plans for FY96

IV.1 Boron Neutron Capture Therapy

There is a general need in the U.S. for a quality beam of neutrons for BNCT experimentation. The Georgia Tech Research Reactor (GTRR) is perceived by numerous groups in BNCT research as the best facility for BNCT applications. The GTRR needs a filter installed in the biomedical facility to produce an optimized epi-thermal neutron beam. A conceptual design for the filter has been completed. It is essential that the filter is installed so that the technology for BNCT application is developed on a timely basis.

IV.2. Other Uses

The NNRC facilities will continue to be used for research, for service to industry, and for education.

BUDGET REQUEST FOR FY 96

Table II

BUDGET REQUEST

For the 1995-1996 University Reactor Sharing Program, Georgia Tech is requesting funding in the amount of $30,000.

We believe that irradiation services at published rates including the use of the reactor and related facilities and any necessary technical assistance by the user institution requires $30,000.00.

V. Partial Publications Generated through the use of the Georgia Tech Research Reactor

1. Graham, Waverly (1966), "The Determination of Effective Delayed Neutron and Photoneutron Kinetics Parameters in as Highly Enriched Heavy-Water Reactor," School of Nuclear Engineering, Georgia Tech.

2. Macdonald, Robert (1966), "A Method for the Analysis of Modulated Neutron Experiments," School of Nuclear engineering, Georgia Tech.

3. Johnson, Robert (1967), "Investigation of the Space-Dependent Zero-Power Reactor Source Transfer Function," School of Nuclear Engineering, Georgia Tech.

4. McGhee, (1969), "Measurement of Neutron Diffusion Parameters of Heavy Water and Spheres by the Pulsed Neutron Source Method," School of Nuclear Engineering, Georgia Tech.

5. Champlin, Jerry B. (1970), "The Transport of Radioisotopes by Fine particulate Matter in Aquifers," School of Nuclear Engineering, Georgia Tech.

6. Walker, David, M. (1970), "An Investigation of Multiple Gamma Scattering in Germanium as Applied to GE(LI) Gamma Spectrometers," School of Nuclear Engineering, Georgia Tech.

7. Wilkie, William H. (1970), "Theoretical Image-Forming Quality of Fast-Neutron Radiography," School of Nuclear Engineering, Georgia Tech.

8. Bridges, Donald N. (1971), "An Investigation of the Spatially-Dependent Reactor Source Transfer Function with Temperature Feedback," School of Nuclear Engineering, Georgia Tech.

9. Ebert, David (1972), "Space and Energy-Dependent Noise Analysis Using Modal Expansions," School of Nuclear Engineering, Georgia Tech.

10. Lord, Robert J. (1972), "Simulated Boiling Effects in a Subcritical Assembly," School of Nuclear Engineering, Georgia Tech.

11. Lake, James (1973), "Measurement of Steady-State Space-Dependent Thermal Neutron Spectra in Beryllium," School of Nuclear Engineering, Georgia Tech.

12. Shamasundar, B.I. (1973), "Investigation of Neutron Thermalization in Polycrystalline Moderators," School of Nuclear Engineering, Georgia Tech.

13. Sohrabi, M. (1975), "Electrochemical Etching Amplification of Low-Lit Recoil Particle Tracks in Polymers for Fast Neutron Dosimetry," School of Nuclear Engineering, Georgia Tech.

14. Jameson, (1976), "Analysis of Fissionable Material by Delayed Emissions," School of Nuclear Engineering, Georgia Tech.

15. Renier, Jean-Paul (1976), "Multi-Group, Multi-Dimensional Investigations of the Power Spectral Densities of the GTRR and the Fast-Thermal Argonaut Reactor," School of Nuclear Engineering, Georgia Tech.

16. Alzaidi, Samir (1977), "New Neutron Detector Using Magnetically Focused Electrons for Fast Reactor Neutron Flux Measurements," School of Nuclear Engineering, Georgia Tech.

17. Reed, Rodican P. (1977), "Neutron Activation analysis of Cataractous Lenses of Mice and Mongolian Gerbils Exposed to Acute Doses of X-rays, Thermal and Fast Neutrons," School of Nuclear Engineering, Georgia Tech.

18. Mahaffey, James (1979), "A Measurable Relationship Between Flux Tilt and Excess Reactivity in a Tightly Coupled Reactor," School of Nuclear Engineering, Georgia Tech.

19. Wahlig, Barry G. (1981), "Transport of Suspended Matter Through Rock formations," School of Nuclear Engineering, Georgia Tech.

20. Sanders, Michael E. (1983), Design and Application of a Damage-Trac-K Neutron Dosimeter Useable in the 1 EV to 17 MEV Neutron Energy Region," School of Nuclear Engineering, Georgia Tech.

21. Noonan, Denise J. (1984), "An Epithermal Neutron Beam Approach to Boron Neutron Capture Therapy," School of Nuclear Engineering, Georgia Tech.

22. Dawes, M.A., R.S. Saini, M.a. Mullen, J.H. Brower, and P.A. Loretan (1986), "Sensitivity of Sweet Potato Weevil (Coleoptera: Curculionidae) to Gamma Radiation." Accepted for publication in Journal to Economic Entomology.

23. Lu, J.Y., C. Stevens and P.A. Loretan (1986), "The Effect of Gamma, Electron Beam and Ultraviolet Radiation on the Control of Storage rot and the Quality of Walla Walla Onions." Submitted to the Journal of Food Science for Publication.

24. Lu, J.Y., S. White, P. Yakubu and P.A. Loretan (1986), "Effects of Gamma Radiation on Nutritive and Sensory Qualities of Sweet Potato Storage Roots." Submitted to Journal of Food Quality for publication.

25. Bonsi, C.P., P.A. Loretan and P. David (1986), "Influence of Gamma Radiation on Storage Rot of Sweet Potatoes." Submitted to Plant Disease for publication.

26. Bonsi, C.P., P.A. Loretan and P. David (1986), "Effect of Gamma Radiation in Prolonging the Shelf-Life of Sweet Potatoes." Submitted to Phytopathology for publication.

27. Williams, C.S., R.A. Chung, A. Brown, B. Harvey, P.A. Loretan, C. Bonsi and M. Tolbert (1986), "Radiation Induced Ultrastructural Changes in Sweet Potato." Abstract submitted to the Institute for Food Technologists for presentation as a poster at the annual IFT Meeting, June 16-19, 1987, Las Vegas, Nevada.

28. "Reaction of Benzenediazonium-2-carboxylate with Reactor-Produced No-Carrier-Added ^{18}F-Fluoride: A Novel Synthesis of 2-[^{18}F]-Fluorobenzoic Acid." A.D. Strouphauer, C.L. Liotta, and R.W. Fink, Int. J. Appl. Radiat. and Isotopes (accepted and in press for early 1984); accepted for presentation at the Symposium on Chemical Considerations in the Labeling of Radiopharmaceuticals with Short-Lived Radionuclides at the American Chemical Society meeting, April, 1984, St. Louis, Missouri.

29. "Preparation of $H^{18}F$,$K^{18}F$,$K^{18}FF_3$ from Reactor-Produced ^{18}F-Fluoride for the Suntheses of Radioactive ^{18}F-Labeled Aromatic Compounds," A.D. Strouphauer, M.S. thesis, School of Chemistry, Georgia Tech (June, 1983).

30. "Preparation of Reactor-Produced Carrier-Free ^{18}F-Fluoride as the Potassium 18-Crown-6 Complex for Synthesis of Labeled Organic Compounds," B.E. Gnade, G.P. Schwaiger, C.L. Liotta, and R.W. Fink, Int. J. Appl. Radiat. and Isotopes, 32, 91 (1981).

31. "The Preparation of Reactor-Produced, Carrier-Free ^{18}F-Fluoride for the Synthesis of Labeled Organic Compounds," Part II, Bruce Edward Gnade, Ph.D. thesis, School of Chemistry, Georgia Tech (September, 1982).

32. "Preparation of Reactor-Produced No-Carrier Added ^{18}F-Fluoride and Its Use in the Sunthesis of Labeled Organic Compounds of Interest in Radiopharmaceuticals (tentative title), R.W. Fink, to be presented as a review paper at the Int. Conf. on Nuclear and Radiochemistry, Lindau, West Germany, October, 1984 (tentative, pending travel grant from Georgia Tech Foundation.

33. "A Remote Device for De-Encapsulating Reactor-Irradiated Samples," G.P. Schwaiger and R.W. Fink, Nucl. Instr. Meth. 186, 663 (1981).

34. "Thermal Neutron Cross Sections and Resonance Integrals for Activation Analysis, "R.W. Fink, in Handbook of Spectroscopy, Vol. 3, edited by J.W. Robinson (CRC Press, Boca Raton, Florida, 1981); pp. 95-123.

35. "Production of 14 Plus or Minus 2 MeV Neutrons in a Reactor with an Enriched LiD Irradiation Capsule," C. Papanicolopoulos and R.W. Fink, Nucl. Instr. Meth., 151, 53 (1978).

36. "The K-Shell Conversion Coefficient of the 135.5 keV M4 Transition in ^{193m}Pt decay," A.I. Saleh, R.A. Braga, and R.W. Fink, Z. Physik A279, 27 (1976).

37. "A Precision Determination of the K-Shell Internal Conversion Coefficient of the 135.5 keV M4 Transition in ^{193m}Pt" Ali I. Saleh, M.S. Thesis, School of Chemistry, Georgia Tech (August 1976).

38. "Trace Elements in Normal and Malignant Human Breast Tissue," A.E. Schwartz, G.W. Leddicotte, R.W. Fink, and E.W. Friedman, Surgery 76, 325 (1974).

39. "The K-Conversion Coefficient Near Threshold of the 30 keV Isomeric Transition in ^{108m}Ag Decay," W.D. Schmidt-Ott and R.W. Fink, Z. Physik 254, 281 (1972).

40. "The L_2 and L_3 Subshell X-Ray Fluorescence Yields for Z = 76 and 78 from the Decay of ^{192}Ir," S. Mohan, W.D. Schmidt-Ott, J.C. McGeorge, and R.W. Fink, in Inner Shell Ionization Phenomena and Future Applications, edited by R.W. Fink, et al (U.S. Atomic Energy Commission, 1973); pp. 244.

41. "A Multiwire Proportional Counter Measurement of the M/L Orbital Electron Capture ratio in ^{71}Ge Decay," H. Genz, J.P. Renier, J.G. Pengra, and R.W. Fink, Phys. Rev. C3, 172 (1971) and Bull. Am. Phys. Soc. 15, 1345 (1970).

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46. "Thermal Neutron Activation Cross Sections for Kr and Xe Isotopes," E. Kondiah, N. Ranakumar, and R.W. Fink, Nucl. Phys. A120, 329 (1968) and Bull. Am. Phys. Soc. 13, 1422 (1968).

47. Gamma Rays from the Decay of ^{75}Ge and ^{77}Ge," Anne Ng, R.E. Wood, J.M. Palms, P.V. Rao, and R.W. Fink, Nucl. Rev. 176, 1328 (1968) and Bull. Am. Phys. Soc. 13, 1422 (1968).

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49. "Studies of the M/L Orbital Electron Capture Ratio in Ar^{37} Decay," M.S. thesis, Georgia Tech, Jean-Paul Renier, School of Nuclear Engineering (June, 1967).

50. "Lifetime of the 724.3 keV Level and Shell-Model Intruder States in ^{109}Ag," R.A. Braga and R.W. Fink, Phys. Rev. C26, 1302 (1982).

51. "L-L_3 Coster-Kronig Transition probability of Z=54," P.B. Semmes, R.A. Braga, J.C. Griffin and R.W. Fink, School of Chemistry, Georgia Tech (October 1986).

52. "Petrology and Geochemistry of the Huerto Formations San Juan Volcanic Field, South Central Colorado," D. Askren and M. Roden, Symposium at Rocky Mountain Meeting of Geological Society of America (1987).

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54. Dyer, N.C., and Brill, A.B.: Use of the Stable Tracers Fe-58 and Cr-50 for the Study of Iron Utilization in Pregnant Women," Nuclear Activation Techniques in the Life Sciences. IAEA, pp. 469-477, 1972.

55. Dyer, N.C., Brill, A.B., Tsiantos, A.K., Sell, E., Victorin, L.H., and Stahlman, M.T.: "Timing of Intracranial Bleeding in Newborn Infants," J. Nucl. Med. 14, 807-811, 1973.

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A-60-609
N/A
3

GEORGIA TECH RESEARCH CORPORATION

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
PROGRAM INITIATION DIVISION
ATLANTA, GEORGIA 30332-0420
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Telex: 542507 GTRC OCA ATL
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Phone: (404) 894-4817

Refer to: RDF/02.141.002.95.013
A-60-609

14 March 1995

U. S. Department of Energy
Office of Nuclear Energy
Office of Policy and Management
Information and Contract Management Branch, NE-133
19901 Germantown Road
Germantown, Maryland 20874

Attention: Mr. E. G. Tourigny, Chief
Technical Support Branch

Subject: Research Proposal Entitled, "Reactor Sharing"

Reference: DOE University Reactor Sharing Program Guidelines dated January 1995

Due Date: 24 March 1995

Mr. Tourigny:

GEORGIA TECH RESEARCH CORPORATION is pleased to submit the subject proposal for your consideration. A description of the research program, the time required and the estimated costs are included in the proposal. In the event of an award, we request that the work be authorized by an amendment to Grant No. De-FG05-92ER75807.

We appreciate the opportunity to submit this proposal. If you need any additional information, please contact us at your convenience. Technical matters should be referred to Dr. R. A. Karam at 404/894-3620 and administrative matters to the undersigned at 404/894-4817. We look forward to hearing from you soon.

Sincerely,

R. Dennis Farmer
Contracting Officer

Addressee: Original + 4 copies
Enclosure: Proposal - Original + 4 copies

cc: Terry R. Lash
U.S. Department of Energy
Office of Nuclear Energy
Office of Policy and Management
1000 Independence Avenue, S.W.
NE-1, Room 5A-143
Washington, DC 20585 - One complete copy of proposal

DOE F 4650.2
(10/91)
(All Other Editions Are Obsolete)

Department of Energy
Office of Energy Research (OER)
Face Page

OMB Control No.
1910-1400
(OMB Burden Disclosure
Statement on Back)

TITLE OF PROPOSED RESEARCH: Reactor Sharing

PLEASE TYPE THE FOLLOWING INFORMATION:

1. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 81.049

2. CONGRESSIONAL DISTRICT:
Applicant Organ's Dist.: Fifth
Project Site's Dist.:

3. I.R.S. ENTITY IDENTIFICATION OR SOCIAL SECURITY NUMBER:
58-0603146

4. AREA OF RESEARCH OR ANNOUNCEMENT TITLE/NUMBER

5. HAS THIS RESEARCH PROPOSAL BEEN SUBMITTED TO ANY OTHER FEDERAL AGENGY? [ ] yes [X] no
PLEASE LIST

6. DOE/OER PROGRAM STAFF CONTACT (IF KNOWN)
Keith Brown

7. TYPE OF APPLICATION: [ ] New [X] Continuation [ ] Supplement [ ] Renewal [ ] Revision

8. ORGANIZATION TYPE:

State Government	[ ]	Local Government	[ ]		
Indian Tribal Government	[ ]	Non-Profit	[X]	Hospital	[ ]
Inst. of Higher Educ	[X]	Individual	[ ]	Other	[ ]
(Small Business	[ ]	For-Profit	[ ]		
Women-owned	[ ]	Disadvantage Bus.	[ ]	8(a)	[ ]

9. CURRENT DOE AWARD NUMBER (IF APPLICABLE)
DE-FG05-92ER75807

10. WILL THIS RESEARCH INVOLVE:
10A. Human Subjects [X] no [ ] If yes,
Exemption No. (or)
IRB Approval Date
Assurance of Compliance No.

10B. Vertebrate Animals [X] no [ ] If yes,
IACUC Approval Date
Animal Welfare Assur. No.

11. AMOUNT REQUESTED FROM DOE FOR ENTIRE PROJECT PERIOD $110,370

12. DURATION OF ENTIRE PROJECT PERIOD
9/30/92 (Mo / day / yr.) to 8/31/96 (Mo / day / yr.)

13. REQUESTED AWARD START DATE
9/1/95 (Mo / day / yr.)

14. IS APPLICANT DELINQUENT ON ANY FEDERAL DEBT?
[ ] Yes (If "Yes," attach an explanation)
[X] No

15. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR NAME, TITLE, ADDRESS AND PHONE NUMBER

R. A. Karam, Director
Neely Nuclear Research Center
Georgia Institute of Technology
900 Atlantic Drive
Atlanta, GA 30332-0425

404/894-3620

SIGNATURE OF PRINCIPAL INVESTIGATOR/ PROGRAM DIRECTOR — DATE: 3/14/95

I/PD ASSURANCE: I agree to accept responsibility for the scientific conduct of the project nd to provide the required progress reports if an award is made as a result of this sub- ission. Willful provision of false information is a criminal offense. U.S.Code, Title 18, Section 1001).

16. ORGANIZATION'S NAME, ADDRESS AND CERTIFYING REPRESENTATIVE'S NAME, TITLE AND PHONE NUMBER

Georgia Tech Research Corporation
Centennial Research Building, Room 246
Georgia Institute of Technology
Atlanta, GA 30332-0420
R. Dennis Farmer / Contracting Officer
404/894-4817

SIGNATURE OF ORGANIZATION'S CERTIFYING REPRESENTATIVE — DATE: 3/14/95

CERTIFICATION & ACCEPTANCE: I certify that the statements herein are true and complete to the best of my knowledge, and accept the obligation to comply with DOE terms and conditions if an award is made as the result of this submission. A willfully false certification is a criminal offense. (U.S. Code, Title 18, Section 1001).

OTICE FOR HANDLING PROPOSALS

This submission is to used only for DOE evaluation purposes and this notice shall be affixed to any reproduction or abstract thereof. All Government and non-Government personnel handling this bmission shall exercise extreme care to ensure that the information contained herein is not duplicated, used, or disclosed in whole or in part for any purpose other than evaluation without written p ission except that if an award is made based on this submission, the terms of the award shall control disclosure and use. This notice does not limit the Government's right to use information conta the submission if it is obtainable from another source without restriction. This is a Government notice, and shall not itself be construed to impose any liability upon the Government or Government nnel for any disclosure or use of data contained in this submission.

RIVACY ACT STATEMENT

If applicable, you are requested, in accordance with 5 U.S.C., Sec. 552A, to voluntarily provide your Social Security Number (SSN). However, you will not be denied any right, benefit, or privilege p led by law because of a refusal to disclose your SSN. We request your SSN to aid in accurate identification, referral and review of applications for research/training support and for efficient manag nt of Office of Energy Research grant/contract programs.

OMB Approval No. 0348-0043

APPLICATION FOR FEDERAL ASSISTANCE

2. DATE SUBMITTED	Applicant Identifier
3/14/95	
3. DATE RECEIVED BY STATE	State Application Identifier
4. DATE RECEIVED BY FEDERAL AGENCY	Federal Identifier

1. TYPE OF SUBMISSION:

Application	*Preapplication*
[ ] Construction	[ ] Construction
[X] Non-Construction	[ ] Non-Construction

5. APPLICANT INFORMATION

Legal Name: Georgia Tech Research Corporation

Organizational Unit: Neely Nuclear Research Center

Address *(give city, county, state, and zip code):*
Centennial Research Building, Room 246
Georgia Institute of Technology
Atlanta, Fulton, Georgia 30332-0420

Name and telephone number of the person to be contacted on matters involving this application *(give area code)*
Dr. R. A. Karam
404/894-3600

6. EMPLOYER IDENTIFICATION NUMBER (EIN): 58-0603146

7. TYPE OF APPLICANT: *(enter appropriate letter in box)* [I]

A. State
B. County
C. Municipal
D. Township
E. Interstate
F. Intermunicipal
G. Special District
H. Independent School Dist.
I. State Controlled Institution of Higher Education
J. Private University
K. Indian Tribe
L. Individual
M. Profit Organization
N. Other (Specify):

8. TYPE OF APPLICATION:

[ ] New [X] Continuation [ ] Revision

If Revision, enter appropriate letter(s) in box(es): [ ] [ ]
A. Increase Award B. Decrease Award C. Increase Duration
D. Decrease Duration Other (specify):

9. NAME OF FEDERAL AGENCY:
Department of Energy

10. CATALOG OF FEDERAL DOMESTIC ASSISTANCE NUMBER: 81-049

TITLE:

11. DESCRIPTIVE TITLE OF APPLICANT'S PROJECT:
Reactor Sharing

9. AREAS AFFECTED BY PROJECT *(cities, counties, states, etc.):*

13. PROPOSED PROJECT:

Start Date	Ending Date
9/1/95	8/31/96

14. CONGRESSIONAL DISTRICTS OF:

a. Applicant	b. Project
Fifth	

15. ESTIMATED FUNDING:

a. Federal	$30,000	.00
b. Applicant		.00
c. State		.00
d. Local		.00
e. Other		.00
f. Program Income		.00
g. TOTAL	$30,000	.00

16. IS APPLICATION SUBJECT TO REVIEW BY STATE EXECTIVE ORDER 12372 PROCESS?

a. YES THIS PREAPPLICATION/APPLICATION WAS MADE AVAILABLE TO THE STATE EXECUTIVE ORDER 12372 PROCESS FOR REVIEW ON:

DATE _____

b. NO [X] PROGRAM IS NOT COVERED BY E.O. 12372

[ ] OR PROGRAM HAS NOT BEEN SELECTED BY STATE FOR REVIEW

17. IS APPLICANT DELINQUENT ON ANY FEDERAL DEBT?

[ ] Yes If "Yes," attach an explanation. [X] No

18. TO THE BEST OF MY KNOWLEDGE AND BELIEF, ALL DATA IN THIS APPLICATION/PREAPPLICATION ARE TRUE AND CORRECT. THE DOCUMENT HAS BEEN DULY AUTHORIZED BY THE GOVERNING BODY OF THE APPLICANT AND THE APPLICANT WILL COMPLY WITH THE ATTACHED ASSURANCES IF THE ASSISTANCE IS AWARED

a. Typed Name of Authorized Representative	b. Title	c. Telephone number
R. Dennis Farmer	Contracting Officer	404/894-4817

d. Signature of Authorized Representative	e. Date Signed
	3/14/95

Previous Editions Not Usable

Standard Form 424 (REV 4-88)
Prescribed by OMB Circular A-102

Authorized for L

DOE F 4620.1
(04-93)
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U.S. Department of Energy
Budget Page
(See reverse for instructions)

OMB Control No.
1910-1400
OMB Burden Disclosure
Statement on Reverse

ORGANIZATION
Georgia Tech Research Corporation

Budget Page No: 1

PRINCIPAL INVESTIGATOR (PI)/PROJECT DIRECTOR (PD)
R. A. Karam

Requested Duration: 12 (Months)

A. SENIOR PERSONNEL: PI/PD, Co-PI's, Faculty and Other Senior Associates (List each separately with title, A.7. show number in bracket(s))	DOE Funded Person - mos			Funds Requested by Applicant	Funds Granted by DOE
	CAL	ACAD	SUMR		
1.					
2.					
3.					
4.					
5.					
6. ( ) OTHERS (LIST INDIVIDUALLY ON BUDGET EXPLANATION PAGE)					
7. ( ) TOTAL SENIOR PERSONNEL (1-6)					
B. OTHER PERSONNEL (SHOW NUMBERS IN BRACKETS)					
1. ( ) POST DOCTORAL ASSOCIATES					
2. ( ) OTHER PROFESSIONALS (TECHNICIAN, PROGRAMMER, ETC.)					
3. ( ) GRADUATE STUDENTS					
4. ( ) UNDERGRADUATE STUDENTS					
5. ( ) SECRETARIAL - CLERICAL					
6. ( ) OTHER					
TOTAL SALARIES AND WAGES (A + B)					
C. FRINGE BENEFITS (IF CHARGED AS DIRECT COSTS)					
TOTAL SALARIES, WAGES AND FRINGE BENEFITS (A + B + C)					
D. PERMANENT EQUIPMENT (LIST ITEM AND DOLLAR AMOUNT FOR EACH ITEM)					
TOTAL PERMANENT EQUIPMENT					
E. TRAVEL 1. DOMESTIC (INCL. CANADA AND U.S. POSSESSIONS)					
2. FOREIGN					
TOTAL TRAVEL					
F. TRAINEE/PARTICIPANT COSTS					
1. STIPENDS (itemize levels, types + totals on budget justification page)					
2. TUITION & FEES					
3. TRAINEE TRAVEL					
4. OTHER (fully explain on justification page)					
TOTAL PARTICIPANTS ( ) TOTAL COST					
G. OTHER DIRECT COSTS					
1. MATERIALS AND SUPPLIES (Reactor Operations)				30,000.00	
2. PUBLICATION COSTS/DOCUMENTATION/DISSEMINATION					
3. CONSULTANT SERVICES					
4. COMPUTER (ADP) SERVICES					
5. SUBCONTRACTS					
6. OTHER					
TOTAL OTHER DIRECT COSTS				30,000.00	
H. TOTAL DIRECT COSTS (A THROUGH G)					
I. INDIRECT COSTS (SPECIFY RATE AND BASE)					
TOTAL INDIRECT COSTS					
J. TOTAL DIRECT AND INDIRECT COSTS (H + I)				30,000.00	
K. AMOUNT OF ANY REQUIRED COST-SHARING FROM NON-FEDERAL SOURCES					
L. TOTAL COST OF PROJECT (J + K)				30,000.00	

DE-FG05-92ER75807

ESTIMATE OF REACTOR OPERATION

1. Objects requiring monitoring* and/or personnel presence from sponsoring unit	7 x $1,150 = $ 8,050
2. Objects not requiring monitoring with size of any dimension greater than 4.5 feet and/or weights more than 1,000 lbs.	2 x $1,350 = $ 2,700
3. Objects not requiring monitoring less than 100 lbs./less than 4.5 feet	10 x $1,150 = $11,500
4. Pipe Irradiation less than 6 inches diameter and less than 4 inches in length	5 x $ 450 = $ 2,250 5 x $ 500 = $ 2,500
5. Set up and schedule fee	6 x $ 500 = $ 3,000
	TOTAL= $30,000

*Monitoring is defined as client personnel present taking electrical/mechanical data; test specimens being powered, pressurized, etc.

Georgia Institute of Technology
NEELY NUCLEAR RESEARCH CENTER
900 ATLANTIC DRIVE
ATLANTA, GEORGIA 30332-0425
USA

(404) 894-3800

HOT CELL LABORATORY

PRICING LIST 1/1/93

JOB DESCRIPTION	UNIT PRICE
1. Object requiring monitoring* and/or personnel presence from sponsoring unit (i.e., not Ga Tech Staff)	$1150 - $1350/day
2. Object not requiring monitoring with size of any dimension (height, width, or length) greater than 4.5 feet and/ or weights more than 1,000 lbs.	$1350/day
3. Objects not requiring monitoring Less than 1000 lbs. Less than 4.5 feet	$1150/day
4. Pipe Irradiation Less than 6 inches diameter and less than 4 inches in length	$450 - $600/day
5. Set up and schedule fee. This fee is credited against any irradiation carried out on schedule. For canceled or rescheduling irradiations there will be a surcharge fee.	$500.00

*Monitoring is defined as client personnel present taking electrical/mechanical data; test specimens being powered, pressurized, etc.

PRICES EFFECTIVE IMMEDIATELY

QA audits $100/hr
QA surveys full

OMB Approval No. 0348-0044

BUDGET INFORMATION - Non-Construction Programs

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1.		$	$	$ 30,000	$	$ 30,000
2.						
3.						
4.						
5. TOTALS				30,000		30,000

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY				Total
	(1)	(2)	(3)	(4)	(5)
a. Personnel	$	$	$	$	$
b. Fringe Benefits					
c. Travel					
d. Equipment					
e. Supplies	30,000				30,000
f. Contractual					
g. Construction					
h. Other					
i. Total Direct Charges (sum of 6a - 6h)					
j. Indirect Charges					
k. TOTALS (sum of 6i and 6j)	$ 30,000	$	$	$	$ 30,000
7. Program Income					

Standard Form 424A (4-88)

Authorized for Local Reproduction

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e) TOTALS
8.	$	$	$	$
9.				
10.				
11.				
12. TOTALS (sum of lines 8 and 11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 30,000	$ 7,500	$ 7,500	$ 7,500	$ 7,500
14. NonFederal					
15. TOTAL (sum of lines 13 and 14)	$ 30,000	$ 7,500	$ 7,500	$ 7,500	$ 7,500

SECTION E- BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS)			
	(b) First	(c) Second	(d) Third	(e) Fourth
16.	$	$	$	$
17.				
18.				
19.				
20. TOTALS (sum of lines 16 - 19)	$	$	$	$

SECTION F - OTHER BUDGET INFORMATION

(Attach additional Sheets if Necessary)

21. Direct Charges:	22. Indirect Charges:

23. Remarks

OMB Approval No. 0348-0040

ASSURANCES — NON-CONSTRUCTION PROGRAMS

ote: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant I certify that the applicant:

1. Has the legal authority to apply for Federal assistance, and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project costs) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States, and if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§ 4728-4763) relating to prescribed standards for merit systems for programs funded under one of the nineteen statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C. §§ 1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. § 794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U.S.C.§§ 6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§ 523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. 290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C § 3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally assisted programs These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply with the provisions of the Hatch Act (5 U.S.C. §§ 1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§ 276a to 276a-7), the Copeland Act (40 U.S.C. § 276c and 18 U.S.C. §§ 874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§ 327-333), regarding labor standards for federally assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program andto purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§ 1451 et seq.); (f) conformity of Federal actions to State (Clear Air) Implementation Plans under Section 176(c) of the Clear Air Act of 1955, as amended (42 U.S.C. § 7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended, (P.L. 93-523); and (h) protection of endangered species under the Endangered Species Act of 1973, as amended, (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§ 1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. 469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. 2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§ 4801 et seq.) which prohibits the use of lead based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act of 1984.

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations and policies governing this program.

SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	TITLE
[illegible]	Contracting Officer
APPLICANT ORGANIZATION	**DATE SUBMITTED**
Georgia Tech Research Corporation	3/14/95

CERTIFICATIONS REGARDING LOBBYING; DEBARMENT, SUSPENSION AND OTHER RESPONSIBILITY MATTERS; AND DRUG-FREE WORKPLACE REQUIREMENTS

Applicants should refer to the regulations cited below to determine the certification to which they are required to attest. Applicants should also review the instructions for certification included in the regulations before completing this form. Signature of this form provides for compliance with certification requirements under 34 CFR Part 82, "New Restrictions on Lobbying," and 34 CFR Part 85, "Government-wide Debarment and Suspension (Nonprocurement) and Government-wide Requirements for Drug-Free Workplace (Grants)." The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Energy determines to award the covered transaction, grant, or cooperative agreement.

1. LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

2. DEBARMENT, SUSPENSION, AND OTHER RESPONSIBILITY MATTERS

(1) The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:

(a) Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;

(b) Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;

(c) Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (l)(b) of this certification; and

(d) Have not within a three-year period preceding this application/proposal had one or more public transactions (Federal, State or local) terminated for cause or default.

(2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

3. DRUG-FREE WORKPLACE

This certification is required by the Drug-Free Workplace Act of 1988 (Pub. L. 100-690, Title V, Subtitle D) and is implemented through additions to the Debarment and Suspension regulations, published in the Federal Register on January 31, 1989, and May 25, 1990.

ALTERNATE I
(GRANTEES OTHER THAN INDIVIDUALS)

(1) The grantee certifies that it will or will continue to provide a drug-free workplace by:

(a) Publishing a statement notifying employees that the unlawful manufacture, distribution, dispensing, possession, or use of a controlled substance is prohibited in the grantee's workplace and specifying the actions that will be taken against employees for violation of such prohibition;

(b) Establishing an ongoing drug-free awareness program to inform employees about:

(1) The dangers of drug abuse in the workplace;

(2) The grantee's policy of maintaining a drug-free workplace;

(3) Any available drug counseling, rehabilitation, and employee assistance programs; and

(4) The penalties that may be imposed upon employees for drug abuse violations occurring in the workplace;

(c) Making it a requirement that each employee to be engaged in the performance of the grant be given a copy of the statement required by paragraph (a);

(d) Notifying the employee in the statement required by paragraph (a) that, as a condition of employment under the grant, the employee will:

U.S. Department of Energy
Assurance of Compliance
Nondiscrimination in Federally Assisted Programs

OMB Control No.
1910-0400

OMB Burden Disclosure Statement

Georgia Tech Research Corporation (Hereinafter called the "Applicant")

HEREBY AGREES to comply with Title VI of the Civil Rights Act of 1964 (Pub. L. 88-352), Section 16 of the Federal Energy Administration Act of 1974 (Pub. L. 93-275), Section 401 of the Energy Reorganization Act of 1974 (Pub. L. 93-438), Title IX of the Education Amendments of 1972, as amended, (Pub. L. 92-318, Pub. L. 93-568, and Pub. L. 94-482), Section 504 of the Rehabilitation Act of 1973 (Pub. L. 93-112), the Age Discrimination Act of 1975 (Pub. L. 94-135), Title VIII of the Civil Rights Act of 1968 (Pub. L. 90-284), the Department of Energy Organization Act of 1977 (Pub. L. 95-91), the Energy Conservation and Production Act of 1976, as amended, (Pub. L. 94-385) and Title 10, Code of Federal Regulations, Part 1040. In accordance with the above laws and regulations issued pursuant thereto, the Applicant agrees to assure that no person in the United States shall, on the ground of race, color, national origin, sex, age, or disability, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity in which the Applicant receives Federal assistance from the Department of Energy.

Applicability and Period of Obligation

In the case of any service, financial aid, covered employment, equipment, property, or structure provided, leased, or improved with Federal assistance extended to the Applicant by the Department of Energy, this assurance obligates the Applicant for the period during which Federal assistance is extended. In the case of any transfer of such service, financial aid, equipment, property, or structure, this assurance obligates the transferee for the period during which Federal assistance is extended. If any personal property is so provided, this assurance obligates the Applicant for the period during which it retains ownership or possession of the property. In all other cases, this assurance obligates the Applicant for the period during which the Federal assistance is extended to the Applicant by the Department of Energy.

Employment Practices

Where a primary objective of the Federal assistance is to provide employment or where the Applicant's employment practices affect the delivery of services in programs or activities resulting from Federal assistance extended by the Department, the Applicant agrees not to discriminate on the ground of race, color, national origin, sex, age, or disability, in its employment practices. Such employment practices may include, but are not limited to, recruitment, advertising, hiring, layoff or termination, promotion, demotion, transfer, rates of pay, training and participation in upward mobility programs; or other forms of compensation and use of facilities.

Subrecipient Assurance

The Applicant shall require any individual, organization, or other entity with whom it subcontracts, subgrants, or subleases for the purpose of providing any service, financial aid, equipment, property, or structure to comply with laws and regulations cited above. To this end, the subrecipient shall be required to sign a written assurance form; however, the obligation of both recipient and subrecipient to insure compliance is not relieved by the collection or submission of written assurance forms.

Data Collection and Access to Records

The Applicant agrees to compile and maintain information pertaining to programs or activities developed as a result of the Applicant's receipt of Federal assistance from the Department of Energy. Such information shall include, but is not limited to the following: (1) the manner in which services are or will be provided and related data necessary for determining whether any persons are or will be denied such services on the basis of prohibited discrimination; (2) the population eligible to be served by race, color, national origin, sex, age and disability; (3) data regarding covered employment including use or planned use of bilingual public contact employees serving beneficiaries of the program where necessary to permit effective participation by beneficiaries unable to speak or understand English; (4) the location of existing or proposed facilities connected with the program and related information adequate for determining whether the location has or will have the effect of unnecessarily denying access to any person on the basis of prohibited discrimination; (5) the present or proposed membership by race, color, national origin, sex, age and disability in any planning or advisory body which is an integral part of the program; and (6) any additional written data determined by the Department of Energy to be relevant to the obligation to assure compliance by recipients with laws cited in the first paragraph of this assurance.

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(06-94)
All Other Editions Are Obsolete

OMB Control No.
1910-0400

The Applicant agrees to submit requested data to the Department of Energy regarding programs and activities developed by the Applicant from the use of Federal assistance funds extended by the Department of Energy. Facilities of the Applicant (including the physical plants, buildings, or other structures) and all records, books, accounts, and other sources of information pertinent to the Applicant's compliance with the civil rights laws shall be made available for inspection during normal business hours on request of an officer or employee of the Department of Energy specifically authorized to make such inspections. Instructions in this regard will be provided by the Director, Office of Civil Rights, U.S. Department of Energy.

This assurance is given in consideration of and for the purpose of obtaining any and all Federal grants, loans, contracts (excluding procurement contracts), property, discounts or other Federal assistance extended after the date hereof, to the Applicants by the Department of Energy, including installment payments on account after such data of application for Federal assistance which are approved before such date. The Applicant recognizes and agrees that such Federal assistance will be extended in reliance upon the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, the successors, transferees, and assignees, as well as the person(s) whose signatures appear below and who are authorized to sign this assurance on behalf of the Applicant.

Applicant Certification

The Applicant certifies that it has complied, or that, within 90 days of the date of the grant, it will comply with all applicable requirements of 10 C.F.R. § 1040.5 (a copy will be furnished to the Applicant upon written request to DOE).

Designated Responsible Employee

R. Dennis Farmer, Contracting Officer
Name and Title (Printed or Typed)

(404) 894-4817
Telephone Number

Signature

3/14/95
Date

Georgia Tech Research Corporation
Applicant's Name

(404) 894-4817
Telephone Number

Centennial Research Building, Room 246
400 Tenth Street
Address:

Date

Atlanta, Georgia 30332-0420

Authorized Official:
President, Chief Executive Officer
or Authorized Designee

R. Dennis Farmer, Asst. to the Vice Pres. & Gen. Mgr.
Name and Title (Printed or Typed)

(404) 894-4817
Telephone Number

Signature

3/14/95
Date

ANNUAL REPORT AND PROPOSAL TO CONTINUE REACTOR SHARING PROGRAM

For the Period
September 1, 1993 - August 31, 1994

BY

R. A. KARAM

Neely Nuclear Research Center
Georgia Tech Research Reactor

PREPARED FOR

U.S. Department of Energy
Under Contract No. DE-FG07-80ER10771

TABLE OF CONTENTS

PREFACE

Administrative responsibility for the Neely Nuclear Research Center (NNRC) resides in the Office of the Vice President for Interdisciplinary Programs of the Georgia Institute of Technology. The NNRC houses two major facilities: the Georgia Tech Research Reactor (GTRR) and the Hot Cell Laboratory. The NNRC is a facility of the University System of the State of Georgia and is available to all universities.

This annual progress report of the operation of the GTRR and NNRC is submitted to DOE in accordance with the requirement of Contract No. DE-FG05-80ER10771.

HIGHLIGHTS

The following universities (other than Georgia Tech) have used the facilities at the Neely Nuclear Research Center:

1.	Arizona State University	Arizona
2.	Medical College of Georgia	Georgia
3.	Mississippi State	Mississippi
4.	University of Oklahoma	Oklahoma
5.	Oklahoma State University	Oklahoma
6.	Lehigh University	Pennsylvania
7.	Emory University	Georgia
8.	University of Pennsylvania	Pennsylvania

The inventory of Co-60 sources at the Hot Cell Laboratory is 250,000 Ci. Dose rates of up to 1.0 E7 rads per hour are possible.

Fifteen commercial companies have used the facilities at NNRC.

The sum of $359,696 in sponsored research and services was obtained during the year to support the Center's activities.

Nine graduate students were financially supported by the Center last year.

Thirty seven undergraduate and five graduate students have used the NNRC facilities in laboratory courses.

Over one thousand one hundred visitors from high schools, educational institutions, industry and foreign countries have had conducted tours at the Center.

Over 120 students from Georgia Tech were trained in radiological safety.

Twenty-eight new or revised procedures were written, approved, and instituted at the Neely Nuclear Research Center to bring the use of radioactive substance on the campus under better national safety standards.

Collaboration on Boron Neutron Capture Therapy (BNCT) with Emory University continues. A new Georgia Tech-Emory Center for cancer research has been formed. The main thrust of this center is BNCT research.

I. INTRODUCTION

The Neely Nuclear Research Center, Georgia Institute of Technology, has been a participant in the University Reactor Sharing Program since 1970. During this period, NNRC has made available its 5 MW research reactor, its Co-60 irradiation facility, and its activation analysis laboratory to large numbers of students and faculty from many universities and colleges.

This report of NNRC utilization is prepared in compliance with the requirement of Contract No. DE-FG05-80ER10771 between the U.S. Department of Energy and the Georgia Institute of Technology. The report contains information with regard to facilities descriptions (brief), personnel, organization, and programs.

The Neely Nuclear Research Center of the Georgia Institute of Technology houses two major facilities: the Georgia Tech Research Reactor and the Hot Cell Laboratory.

The GTRR is a heterogeneous, heavy-water moderated and cooled reactor, fueled with plates of aluminum-uranium alloy. It is designed to produce a thermal flux of more than 1.0 E14 $n/cm^2/sec$ at a power of 5 MW and an exit moderator temperature of 139°F.

The reactor core is approximately two feet in diameter, two feet high and, when fully loaded, contains provisions for up to nineteen fuel assemblies spaced six inches apart in a triangular array. Each assembly contains sixteen fuel plates. The total uranium-235 content of a full loading is 3.6 kg. The fuel is centrally located in a six foot diameter aluminum reactor vessel which provides a two foot thick D_2O reflector completely surrounding the core.

II. NNRC Activities

II.1 Reactor Location and Other Specifics

II.1.1 University: Georgia Institute of Technology
Atlanta, GA 30332-0425

II.1.2 Program Director: R.A. Karam (404-894-3620)

II.1.3 Grant #: DE-FG07-80ER10771

II.1.4 Reactor Type/Power Level: Tank Type/5 MW Heavy Water

II.2 Staff and Administration

II.2.1. The following personnel were employed at NNRC full time for the entire reporting period:

1. R.A. Karam, Director
2. Rodney D. Ice, Manager, Office of Radiation Safety
3. Billy Statham, Electronic Engineer
4. Dixon Parker, Reactor Supervisor
5. Clara Galleshaw, Administrative Coordinator
6. Jerry Taylor, Senior Engineering Safety Assistant
7. Edgar Jawdeh, Health Physicist
8. Neil Copeland, Senior Reactor Operator
9. Arlene Smith, Administrative Secretary.

II.2.2. The following personnel were employed part time:

Jeremy Sweezy, SRO; Dwayne Blaylock, RO; Peter Newby, RO; Ralph Demeglio, RO

II.2.3. The following Graduate Students were given GRA's during the reporting period:

1. Thomas Evans
2. Jeremy Sweezy
3. Kate Klee
4. Hannah Mitchell
5. Peter Newby
6. Dwayne Blaylock
7. Jerry Ellsworth
8. Joe Martin
9. John Brunson

II.3 Educational Output

II.3.1 The following courses were taught using the GTRR:

N.E. 4205 Nuclear Reactor Laboratory - Fall 1990
N.E. 4260 Radiation Transport and Shielding -Winter 1992
N.E. 4210 Reactor Operation

II.3.2 Degrees

Kate Klee - PhD Health Physics

II.3.3 Short courses taught

Radiation protection short course given every quarter and attended by more than 30 students each quarter.

II.3.4 Other Courses which used NNRC facilities

N.E. 6110 Radiation Detection - Fall 1993
N.E. 6110 Radiation Detection - Winter 1994
N.E. 3110 Radiation Detection - Spring 1994

II.3.5 High School student tours

NNRC conducted tours to high school students interested in nuclear science. More than 1100 students have toured the NNRC facilities.

II.3.6 Use of NNRC facilities by other universities

The following table shows how principal investigators from various universities, used NNRC facilities, primarily the GTRR, through the Reactor Sharing Program funded by DOE.

TABLE I
Reactor Sharing Services
Sept. 1, 1993 - August 31, 1994

Institution	P.I.	# Students Involved	Program	Reactor Sharing Support
Arizona State	(1) Dr. Paul Fitzgerald (2) E. Stump	6	Fission Track Dating, Uplift and formation of mountain chains	22,555.25
Emory Univ.	Dr. Raymond Schinazy	5	BNCT	1,500.00
Medical College of Georgia	Dr. R. Whitney	3	Bone Marrow Transplant in Mice	807.75
Mississippi State	Dr. Charles Sparrow	7	Reactor Laboratory of Mississippi State students	3,000.00
University of Oklahoma	Dr. Barry Weaver	8	Rare Earth Elements determinations as a tool for rock origin verification;	637.00
Oklahoma State Univ.	Dr. Brian Carter		Fission Track Dating	1,500.00
University of IL			Irradiation Services	550.00
University of PA			Irradiation Services	600.00
High School Tours		1200		5,000.00
TOTAL				36,150.00

II.4. NNRC's staff efforts under U.S. NRC's License No. R-97 and under the State of Georgia License No. 147-1 and License No. 21-2.

II.4.1. Procedure writing and Revision

Significant effort was made to upgrade and write new procedures to bring the use of radioactive substances on the campus of Georgia Tech under national safety standards. A list of these procedures follows.

Proc. #	Title
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
6080	Accidental Release of High Levels of Gaseous Activity to the Atmosphere
6100	Emergency Notification
9250	Facilities Contamination Surveys
9013	Calibration and Testing of Moving Air Particulate Monitor
9037	Tritium Determination in Urine
9038	Bioassay Program
9300	Respiratory Protection
7241	Reactor Tank Level Transmitter Maintenance and Calibration Check
9304	Routine Facility Radiation Surveys
9308	Airborne Radioactivity Surveys
9310	Posting of Radiological Control Areas and Materials
9040	Liquid Waste Tank Analysis
9010	Kanne Chamber Calibration
9501	Control & Accountability of Radioactive Sources

Proc. #	Title
9510	Radioactive Material Shipment
2002	Reactor Operations-Precritical Startup Checklist and Shift Supervisor Approval
9074	Calibration Procedure for Eberline Model PIC-6A Survey Meter
9015	Cooling Water Gamma Monitor
3800	Liquid Waste Disposal
3802	Liquid Waste System-Valve Lineup
7280	MAP-1 Recorder Calibration
0001	Access Control and Accountability of Keys and Access Cards
3500	Moderator Inventory
4501	Fuel Element Self Protection Measurement
7246	Control Element Reactivity Worth Measurement

There were three procedures cancelled:

2500	Containment Building Health Physics Procedures
7276	Temperature Recorder Calibration RTD Input
9054	Calibration of the Low Beta II Alpha/Beta Counting System

II.4.2 U.S. NRC and State Inspections

During the reporting period there were four U.S. NRC inspections and one State of Georgia inspection which involved four inspectors.

II.4.3 Requalifications Program for Reactor Operators

The U.S. NRC examined three canditates for RO licenses, and two for SRO licenses. All candidates passed.

II.5 Research Output

II.5.1 MS Granted

None

II.5.2 Publication

II.5.2.1 Published

"Conceptual Design for an Advanced Epithermal Neutron Beam for BNCT at the GTRR", Sixth International Conference on BNCT, Kobe, Japan, Nov. 1-4, 1994.

II.6 Budget Information

II.6.1 Institutional Funds

II.6.1.1. Regular institutional allocations to NNRC during reporting period were $406,957. This money was spent to partially cover personnel services.

II.6.2 External Funds ($359,696.00)

II.6.2.1 DOE Funds

The following funds were obtained from DOE:

1. Reactor Sharing 30,000

II.6.2.2 ERDA Funding

The funding for ERDA Administration was $192,172.00.

II.6.2.4 Various Companies

Fifteen companies from the metropolitan area of Atlanta and the rest of the U.S. used the NNRC facilities. Revenues from these companies totaled $137,524.00.

III. Problems/Areas of Need/Priorities

III.1. Instrument

Instruments upgrade are needed in few areas. For the reactor the following are needed:

(1) Auto controller;
(2) Intercom system.

Other needed improvements include a new filter for BNCT applications.

III.2 Personnel

Three additional reactor operators were added to the operating staff.

IV. Plans for FY96

IV.1 Boron Neutron Capture Therapy

There is a general need in the U.S. for a quality beam of neutrons for BNCT experimentation. The Georgia Tech Research Reactor (GTRR) is perceived by numerous groups in BNCT research as the best facility for BNCT applications. The GTRR needs a filter installed in the biomedical facility to produce an optimized epi-thermal neutron beam. A conceptual design for the filter has been completed. It is essential that the filter is installed so that the technology for BNCT application is developed on a timely basis.

IV.2. Other Uses

The NNRC facilities will continue to be used for research, for service to industry, and for education.

BUDGET REQUEST FOR FY 96

Table II

BUDGET REQUEST

For the 1995-1996 University Reactor Sharing Program, Georgia Tech is requesting funding in the amount of $30,000.

We believe that irradiation services at published rates including the use of the reactor and related facilities and any necessary technical assistance by the user institution requires $30,000.00.

V. Partial Publications Generated through the use of the Georgia Tech Research Reactor

1. Graham, Waverly (1966), "The Determination of Effective Delayed Neutron and Photoneutron Kinetics Parameters in as Highly Enriched Heavy-Water Reactor," School of Nuclear Engineering, Georgia Tech.

2. Macdonald, Robert (1966), "A Method for the Analysis of Modulated Neutron Experiments," School of Nuclear engineering, Georgia Tech.

3. Johnson, Robert (1967), "Investigation of the Space-Dependent Zero-Power Reactor Source Transfer Function," School of Nuclear Engineering, Georgia Tech.

4. McGhee, (1969), "Measurement of Neutron Diffusion Parameters of Heavy Water and Spheres by the Pulsed Neutron Source Method," School of Nuclear Engineering, Georgia Tech.

5. Champlin, Jerry B. (1970), "The Transport of Radioisotopes by Fine particulate Matter in Aquifers," School of Nuclear Engineering, Georgia Tech.

6. Walker, David, M. (1970), "An Investigation of Multiple Gamma Scattering in Germanium as Applied to GE(LI) Gamma Spectrometers," School of Nuclear Engineering, Georgia Tech.

7. Wilkie, William H. (1970), "Theoretical Image-Forming Quality of Fast-Neutron Radiography," School of Nuclear Engineering, Georgia Tech.

8. Bridges, Donald N. (1971), "An Investigation of the Spatially-Dependent Reactor Source Transfer Function with Temperature Feedback," School of Nuclear Engineering, Georgia Tech.

9. Ebert, David (1972), "Space and Energy-Dependent Noise Analysis Using Modal Expansions," School of Nuclear Engineering, Georgia Tech.

10. Lord, Robert J. (1972), "Simulated Boiling Effects in a Subcritical Assembly," School of Nuclear Engineering, Georgia Tech.

11. Lake, James (1973), "Measurement of Steady-State Space-Dependent Thermal Neutron Spectra in Beryllium," School of Nuclear Engineering, Georgia Tech.

12. Shamasundar, B.I. (1973), "Investigation of Neutron Thermalization in Polycrystalline Moderators," School of Nuclear Engineering, Georgia Tech.

13. Sohrabi, M. (1975), "Electrochemical Etching Amplification of Low-Lit Recoil Particle Tracks in Polymers for Fast Neutron Dosimetry," School of Nuclear Engineering, Georgia Tech.

14. Jameson, (1976), "Analysis of Fissionable Material by Delayed Emissions," School of Nuclear Engineering, Georgia Tech.

15. Renier, Jean-Paul (1976), "Multi-Group, Multi-Dimensional Investigations of the Power Spectral Densities of the GTRR and the Fast-Thermal Argonaut Reactor," School of Nuclear Engineering, Georgia Tech.

16. Alzaidi, Samir (1977), "New Neutron Detector Using Magnetically Focused Electrons for Fast Reactor Neutron Flux Measurements," School of Nuclear Engineering, Georgia Tech.

17. Reed, Rodican P. (1977), "Neutron Activation analysis of Cataractous Lenses of Mice and Mongolian Gerbils Exposed to Acute Doses of X-rays, Thermal and Fast Neutrons," School of Nuclear Engineering, Georgia Tech.

18. Mahaffey, James (1979), "A Measurable Relationship Between Flux Tilt and Excess Reactivity in a Tightly Coupled Reactor," School of Nuclear Engineering, Georgia Tech.

19. Wahlig, Barry G. (1981), "Transport of Suspended Matter Through Rock formations," School of Nuclear Engineering, Georgia Tech.

20. Sanders, Michael E. (1983), Design and Application of a Damage-Trac-K Neutron Dosimeter Useable in the 1 EV to 17 MEV Neutron Energy Region," School of Nuclear Engineering, Georgia Tech.

21. Noonan, Denise J. (1984), "An Epithermal Neutron Beam Approach to Boron Neutron Capture Therapy," School of Nuclear Engineering, Georgia Tech.

22. Dawes, M.A., R.S. Saini, M.a. Mullen, J.H. Brower, and P.A. Loretan (1986), "Sensitivity of Sweet Potato Weevil (Coleoptera: Curculionidae) to Gamma Radiation." Accepted for publication in Journal to Economic Entomology.

23. Lu, J.Y., C. Stevens and P.A. Loretan (1986), "The Effect of Gamma, Electron Beam and Ultraviolet Radiation on the Control of Storage rot and the Quality of Walla Walla Onions." Submitted to the Journal of Food Science for Publication.

24. Lu, J.Y., S. White, P. Yakubu and P.A. Loretan (1986), "Effects of Gamma Radiation on Nutritive and Sensory Qualities of Sweet Potato Storage Roots." Submitted to Journal of Food Quality for publication.

25. Bonsi, C.P., P.A. Loretan and P. David (1986), "Influence of Gamma Radiation on Storage Rot of Sweet Potatoes." Submitted to Plant Disease for publication.

26. Bonsi, C.P., P.A. Loretan and P. David (1986), "Effect of Gamma Radiation in Prolonging the Shelf-Life of Sweet Potatoes." Submitted to Phytopathology for publication.

27. Williams, C.S., R.A. Chung, A. Brown, B. Harvey, P.A. Loretan, C. Bonsi and M. Tolbert (1986), "Radiation Induced Ultrastructural Changes in Sweet Potato." Abstract submitted to the Institute for Food Technologists for presentation as a poster at the annual IFT Meeting, June 16-19, 1987, Las Vegas, Nevada.

28. "Reaction of Benzenediazonium-2-carboxylate with Reactor-Produced No-Carrier-Added ^{18}F-Fluoride: A Novel Synthesis of 2-[^{18}F]-Fluorobenzoic Acid." A.D. Strouphauer, C.L. Liotta, and R.W. Fink, Int. J. Appl. Radiat. and Isotopes (accepted and in press for early 1984); accepted for presentation at the Symposium on Chemical Considerations in the Labeling of Radiopharmaceuticals with Short-Lived Radionuclides at the American Chemical Society meeting, April, 1984, St. Louis, Missouri.

29. "Preparation of $H^{18}F$,$K^{18}F$,$K^{18}FF_3$ from Reactor-Produced ^{18}F-Fluoride for the Sunthesis of Radioactive ^{18}F-Labeled Aromatic Compounds," A.D. Strouphauer, M.S. thesis, School of Chemistry, Georgia Tech (June, 1983).

30. "Preparation of Reactor-Produced Carrier-Free ^{18}F-Fluoride as the Potassium 18-Crown-6 Complex for Synthesis of Labeled Organic Compounds," B.E. Gnade, G.P. Schwaiger, C.L. Liotta, and R.W. Fink, Int. J. Appl. Radiat. and Isotopes, 32, 91 (1981).

31. "The Preparation of Reactor-Produced, Carrier-Free ^{18}F-Fluoride for the Synthesis of Labeled Organic Compounds," Part II, Bruce Edward Gnade, Ph.D. thesis, School of Chemistry, Georgia Tech (September, 1982).

32. "Preparation of Reactor-Produced No-Carrier Added ^{18}F-Fluoride and Its Use in the Sunthesis of Labeled Organic Compounds of Interest in Radiopharmaceuticals (tentative title), R.W. Fink, to be presented as a review paper at the Int. Conf. on Nuclear and Radiochemistry, Lindau, West Germany, October, 1984 (tentative, pending travel grant from Georgia Tech Foundation.

33. "A Remote Device for De-Encapsulating Reactor-Irradiated Samples," G.P. Schwaiger and R.W. Fink, Nucl. Instr. Meth. 186, 663 (1981).

34. "Thermal Neutron Cross Sections and Resonance Integrals for Activation Analysis, "R.W. Fink, in Handbook of Spectroscopy, Vol. 3, edited by J.W. Robinson (CRC Press, Boca Raton, Florida, 1981); pp. 95-123.

35. "Production of 14 Plus or Minus 2 MeV Neutrons in a Reactor with an Enriched LiD Irradiation Capsule," C. Papanicolopoulos and R.W. Fink, Nucl. Instr. Meth., 151, 53 (1978).

36. "The K-Shell Conversion Coefficient of the 135.5 keV M4 Transition in ^{193m}Pt decay," A.I. Saleh, R.A. Braga, and R.W. Fink, Z. Physik A279, 27 (1976).

37. "A Precision Determination of the K-Shell Internal Conversion Coefficient of the 135.5 keV M4 Transition in ^{193m}Pt" Ali I. Saleh, M.S. Thesis, School of Chemistry, Georgia Tech (August 1976).

38. "Trace Elements in Normal and Malignant Human Breast Tissue," A.E. Schwartz, G.W. Leddicotte, R.W. Fink, and E.W. Friedman, Surgery 76, 325 (1974).

39. "The K-Conversion Coefficient Near Threshold of the 30 keV Isomeric Transition in ^{108m}Ag Decay," W.D. Schmidt-Ott and R.W. Fink, Z. Physik 254, 281 (1972).

40. "The L_2 and L_3 Subshell X-Ray Fluorescence Yields for Z = 76 and 78 from the Decay of ^{192}Ir," S. Mohan, W.D. Schmidt-Ott, J.C. McGeorge, and R.W. Fink, in Inner Shell Ionization Phenomena and Future Applications, edited by R.W. Fink, et al (U.S. Atomic Energy Commission, 1973); pp. 244.

41. "A Multiwire Proportional Counter Measurement of the M/L Orbital Electron Capture ratio in ^{71}Ge Decay," H. Genz, J.P. Renier, J.G. Pengra, and R.W. Fink, Phys. Rev. C3, 172 (1971) and Bull. Am. Phys. Soc. 15, 1345 (1970).

42. "Measurement of Electron Capture Probabilities," Harald Genz, Ph.D. thesis, School of Chemistry, Georgia Tech, and Dept. of Physics, Emory University (November, 1971).

43. "Precision Determination of the K-Shell X-Ray Fluorescence Yield of Gallium," H.U. Freund, H. Genz, J.B. Sieberts, and R.W. Fink, Nucl. Phys. A138, 200 (1969).

44. "Total Conversion Coefficient of the 375 keV Transition in ^{199m}Hg Decay," A.K. Hankla, J.H. Hamilton, and R.W. Fink, in Radioactivity in Nuclear Spectroscopy, edited by J.H. Hamilton, et al., (Gordon and Breach Publishers, New York, 1972); pp. 1401.

45. "The K-Conversion Coefficient for the 40.95 keV Transition in the 6.3 Min Decay of ^{94m}Nb," K.S.R. Sastry, R.W. Fink, and P.V. Rao. Bull. Am. Phys. 14, 18 (1969).

46. "Thermal Neutron Activation Cross Sections for Kr and Xe Isotopes," E. Kondiah, N. Ranakumar, and R.W. Fink, Nucl. Phys. A120, 329 (1968) and Bull. Am. Phys. Soc. 13, 1422 (1968).

47. Gamma Rays from the Decay of ^{75}Ge and ^{77}Ge," Anne Ng, R.E. Wood, J.M. Palms, P.V. Rao, and R.W. Fink, Nucl. Rev. 176, 1328 (1968) and Bull. Am. Phys. Soc. 13, 1422 (1968).

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50. "Lifetime of the 724.3 keV Level and Shell-Model Intruder States in ^{109}Ag," R.A. Braga and R.W. Fink, Phys. Rev. C26, 1302 (1982).

51. "L-L_3 Coster-Kronig Transition probability of Z=54," P.B. Semmes, R.A. Braga, J.C. Griffin and R.W. Fink, School of Chemistry, Georgia Tech (October 1986).

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55. Dyer, N.C., Brill, A.B., Tsiantos, A.K., Sell, E., Victorin, L.H., and Stahlman, M.T.: "Timing of Intracranial Bleeding in Newborn Infants," J. Nucl. Med. 14, 807-811, 1973.

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